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The Townsend Bee Book

OR

How to Make a Start in Bees

By
E. D. Townsend
Remus, Mich.

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E.V.

PUBLISHERS' PREFACE

In beekeeping, as in all pursuits, there are always many people just starting in the business, and one of the oft recurring questions that are asked has been, "How can I make a start with bees?" To answer this question properly we engaged Mr. E. D. Townsend, one of the best authorities in bee culture, and who produces honey by the carload, to write a special series of articles having to do primarily with the problems that beset every person who starts this most fascinating of nature studies. These duly appeared in our journal, GLEANINGS IN BEE CULTURE. As they were received with such wide-spread enthusiasm, we decided to incorporate them in book form.

Mr. Townsend is peculiarly fitted for giving instructions along these lines, since he himself learned, by dear experience, how to avoid the common mistakes of an amateur, and, with practically nothing to start with, built up what is probably the most extensive business in connection with bees in the great State of Michigan. Moreover, he has never been carried away, so to speak, by fads and fancies; his advice always bristles with practical common sense.

It is hoped that by compiling these articles in book form we are going to "fill a long-felt want."

THE A. I. ROOT COMPANY.

June 1, 1914.

CONTENTS

CHAPTER I—How I Became a Successful Manager of Bees on a Large Scale 1

CHAPTER II—What Hive to Adopt 6

CHAPTER III—How to Buy Bees 12

CHAPTER IV—Folding Sections and Putting in Foundation 15

CHAPTER V—What to Do Just Preceding the Honey-flow 30

CHAPTER VI—Strong vs. Medium Colonies at the Opening of the Harvest 34

CHAPTER VII—How to Take Care of Swarms . . 37

CHAPTER VIII—Management Previous to the Honey-flow to Prevent Swarms 42

CHAPTER IX—The Honey-flow 47

CHAPTER X—Spring Management 69

CHAPTER XI—Making Up Winter Losses . . . 75

CHAPTER I.

How I Became a Successful Manager of Bees on a Large Scale.

One day in June, 1876, my younger brother and sister coming from school saw a swarm of bees fly overhead. I can remember it as well as though it were yesterday, how I found fault with them for not telling me until after the swarm was out of sight. Probably fifteen or twenty minutes had elapsed after the bees had passed over the road; and since colonies in movable-frame hives were worth $10.00 in those days, and since I had had the bee fever for some two years, I made up my mind to locate that swarm. I was shown where it crossed the road and the direction it took. Before I had gone into the woods ten rods I heard the bees entering a tree, and I soon saw them, for many were still on the outside, while others were circling around making a great noise. They entered a limb well up toward the top of a large elm.

That night I asked a beekeeper when it would be best to transfer the bees from the tree to a frame hive, and he told me that I could do no better than to do it immediately, for the reason that, if the tree were felled before the bees had time to build any comb they could be hived like a natural swarm, without the inconvenience of transferring sticky combs, etc. A third of a century has elapsed since this took place; and if I were asked to-day how to manage in such a case I would give the same answer that this beekeeper gave me. Well, the tree was cut while the bees were flying during the next day; and although their entrance had been 60 feet from the ground not a bee was lost; for as soon as those in the tree started into the new hive, all of the bees heard the " homing hum " and entered the new hive with the rest.

As soon as the tree was down, and before the bees got over being demoralized, the beekeeper who was helping me ran toward the top of the tree; and as soon as he could locate the entrance he smoked the bees so that they could be handled without fear of stings. By sawing in on each side of the entrance, and splitting off a portion of the limb, we opened the cavity where the bees were. The hive was then placed with the entrance as near as

possible to the part where most of the bees were, and with a tin dipper the greater part of them were dipped up and emptied at the hive entrance. By the time we had most of the bees dipped out of the tree in front of the new hive there was this loud " homing " call as the bees commenced running in. At this point of the procedure the few bees that were left in the tree were smoked until they took wing, and then we stepped back so as to be out of the way. All of the flying bees, attracted by the loud hum, soon entered the new hive, which was moved home that night when all flying was over for the day.

It occurs to me to mention here the fact that any beginner noticing a swarm issuing should not rush off to a neighbor for a hive, leaving the swarm clustered, for, as likely as not, the bees will be gone on his return. The better way is to hive them in a soap-box or anything else, for that matter, that can be used temporarily, and, when hived, the box should be set on the stand where it is to remain until the new hive can be brought. Then, as soon as the new hive is obtained, he should go to the swarm in the box and blow some smoke in at the entrance in order to avoid stings. (A beginner should wear a veil until he is thoroughly acquainted with the bees, simply so that he will not be nervous.)

As soon as the new hive is ready the box should be removed from the stand and the empty hive set in its place, with a board slanting up from the ground to the entrance. Now the swarm may be hived just as though it still hung on the tree or limb where it clustered at first. By carefully lifting the box off the bottom-board, and carrying it to the new hive, most of the bees can be shaken out on to the alighting-board with a quick jerk, and they will run in just as though they had been shaken from a limb.

To return to my swarm taken out of the tree, I will simply say that it was divided that season, both colonies gathering sufficient honey to winter well. My next step after getting the bees home was to subscribe for Gleanings. It began coming in July, and has been coming regularly ever since.

HOW MANY COLONIES TO START WITH

The first things to decide upon are the number of colonies to buy, the size of hives, and the season of the year when the start should be made. When I began beekeeping, many of the colonies around me were in hives of a size and style not to my liking; in fact, there was no standard frame in use then as there is now, and the beginner simply followed some one of the leading honey-producers, adopting his hive and frame. All these things are now

changed, and the beginner will have no trouble in finding bees in hives containing regular Langstroth frames. This frame has more points in its favor than any other at the present time, and I would advise the beginner to adopt it.

There is a great diversity of opinion as to the proper number of frames to use in a hive. The majority use eight frames; but quite a number use ten frames to the hive, and a few think that twelve frames are none too many for the best results. It is not the intention of this article to go into the discussion of the hive question; but if the beginner will take my advice he will adopt the ten-frame hive for the production of comb honey, but especially for extracted honey.

After deciding on the size of hive it is important to get the right number of colonies to start with. Beginners should understand from the first that there is much to learn, and that the first few years will be largely experimental, so that not much money wil be made at first. The experience can be acquired about as well with a few colonies as with a large number, and the expense is much less. When starting on a small scale, the increase of bees and experience go together.

It is noticeable that those who have gone into the bee business on a large scale from the very first, without making an effort to get the necessary experience, have usually turned their attention to something else in a few years, usually going back to what they did before. This is the natural thing; for since they knew nothing about the producing of a paying crop of honey the venture proves a failure.

I would recommend at the start from two to four colonies, whether the beginner has much capital or not. I do not think that one without experience can go into this business and depend upon hired experienced help to do the work, for he must know the details himself before he can manage others in such a way as to make a financial success of his plans.

WHEN TO START

An experienced beekeeper need not hesitate to buy bees any season of the year. Some of the best bargaius are found in the fall, for it is then much easier to buy bees than in May, when the prospect of a honey crop is near at hand. However, for one without experience, May is the best month to purchase bees, for he will be sure of having them through one surplus season at least before he has the wintering problem to contend with, and this much experience will help him in the solving of the wintering problem.

NOT NECESSARY TO BUY OLD HIVES

When buying bees, see that the combs are in good modern frames of Langstroth size. The hive is of secondary importance; for if the combs are of the worker size, and straight and true, they can be transferred to frames in new hives. This is the way most of our buying is done; for after the bees are transferred the old hives are returned, for we do not want them. If the beginner were to buy three or four old hives, and use them in connection with new ones, they would never be satisfactory. It usually happens that bees can be bought enough cheaper without the hives to make it more economical all around to buy new hives outright.

THE SELECTION OF THE NECESSARY EQUIPMENT

I would recommend that the beginner commence his beekeeping career with the production of comb honey, and that all increase be made by natural swarms. Gradually the production of extracted honey can be taken up. I know it is generally considered that extracted-honey production is more easily learned than comb-honey production; and I admit that, if the beginner were to commence the season with half of his colonies worked for comb honey and half for extracted, the half worked for extracted honey would probably be the more profitable that season; but there are many pitfalls in the production of extracted honey not found in the production of comb, and the beginner might be the loser in the end if he produced extracted honey from the start. A part of the danger lies in the fact that, in producing extracted honey, much of the increase has to be made artificially. Besides this, one not entirely familiar with the business might allow more extracted-honey colonies to starve than he would comb-honey colonies, for the latter will have a good stock of the early or better quality of honey for winter stores. In the case of colonies run for extracted honey, on the other hand, the early and better honey is more likely to be placed in the upper story, which usually contains an abundance of comb room. It is true that sugar syrup could be fed to make up this deficit; but this would only add another burden, which the beginner had better avoid at the start.

All artificial-swarming methods should be avoided for the first few years until the beginner has more experience, and until some of the known principles are learned. After this, these other principles of beekeeping can be taken up.

If more comb honey than extracted is to be produced the first season, it will be necessary to buy rather more supplies. I assume

that either the eight or ten frame hive will be adopted, containing frames of Langstroth dimensions. The hive that we would order is the regular dovetailed hive for comb-honey production, having a reversible bottom-board made of ⅞-inch material. These bottom-boards are much superior to some that have been on the market in former years. We have used very similar one for the past twelve years, and know that they are good. The super of this hive should contain 4¼ x 4¼ x 1½-inch plain sections and fence separators. In my opinion, there is no better section on the market to-day than the 4¼ square plain section.

If four good colonies of bees are bought the first season, and these colonies and the increase are to be put into new hives, about ten hives will be needed. There should be ten hive-bodies, ten covers, ten bottom-boards, and twenty supers; and all the inside furnishings should be included. The frame should be pierced, and the wire should be sent for wiring them.

If the supers are used as we use ours, extracting-frames will replace the outside section-holders in each super. These frames are made the same size as the section-holders, but they have a top-bar. Both top and bottom bars are ⅞ inch wide, the top-bar being ⅜ inch thick, and provided with a beveled groove and wedge for fastening the foundation. These extracting-frames should be pierced for two wires, and full sheets of thin super foundation should be used in them.

As the supers, as ordered, do not include sections, 1000 4¼ x 4¼ x 1½-inch plain sections should be ordered. One would probably not use a thousand the first year; but during a good year more than 500 would be necessary, and it is well to order sections in full packages.

For supplying these sections with full sheets of foundation, about eight pounds of the extra-thin super foundation will be needed.

Brood-frames should all be pierced for wiring. The piercing and the wire for wiring the frames costs about ten cents extra per hundred frames. Full sheets of medium brood foundation should be used, and it will take thirteen or fourteen pounds to fill one hundred frames. The use of starters in brood-frames is very poor economy. I have tried both starters and full sheets.

There is no better uncapping-knife than the Improved Bingham. We order them made one inch longer than the regular size, but very good work can be done with the knives of ordinary length. A Coggshall brush is very essential for freeing the combs of bees when extracting or at any other time.

It might be well to have two or three extra stories the same as the hive-bodies, for there are sometimes combs that are undesirable for use in the brood-nest, but which would be all right for extracting-frames. In this way, even if no particular pains are taken for producing extracted honey, some may be secured the first season. The second season, all extra combs from dead or queenless colonies should be used for extracting-combs. Then if shallow extracting-combs are used in the comb-honey supers, as I have recommended, by the second year, at least, quite an amount of extracted honey may be produced. In this way the beginner may be gradually drawn into the production of both comb and extracted honey until, before long, half of the yard may be worked for each. The amount of extracted honey can be regulated, however, for if more empty combs accumulate than are needed for extracted honey the swarms could be hived on them.

CHAPER II.

What Hive to Adopt

A DISCUSSION OF THE MERITS OF THE DIFFERENT HIVES, TAKING INTO CONSIDERATION THE MAN, THE METHODS, AND THE LOCALITY

The proper hive to use is a question that confronts every beginner. The kind, size, and shape of the hive best adapted for the purpose must be taken into consideration, and these depend upon whether comb or extracted honey is produced; whether the colonies are all in one yard or in several outyards, etc.

In reading the current literature on the subject, much confusion of ideas is noticeable; for in some locations, where conditions ought to be the same, one beekeeper will use a large hive and the other a small one, each being successful with his own preferred size. This reminds me of a little incident that came up in our convention at Saginaw. Mr. W. J. Manley, of Sandusky, told of buying about 60 colonies of bees, one of which was in a soap-box. This soap-box colony was inverted, an upper story put on, and, although the colony was handled the same as the others, several more pounds of honey were extracted from it than from any other individual colony in the yard. This only goes to show that bees

will store honey in almost any kind of hive; and, further, that a hive poorly proportioned can be so manipulated as to yield fair results in the production of honey. But in this case it is, of course, the man and not the hive that should get the credit. In this article I propose to fit the man to the hive, the hive to the man, and both to the location.

It has been my fortune (or perhaps misfortune) to be the owner of almost all kinds and sizes of hives, including the ten-frame Gallup and the ten-frame Quinby—hives varying in size from 1000 to 1800 square inches of brood-comb space. I have also had the eight, ten, and twelve frame Langstroth hive; and many times different sizes and styles of hives were in the same yard. My experience with such has extended over many seasons, so that I am in condition to know which size and style are best adapted to my locality and to my particular system of management, etc.

Probably two-thirds of the colonies in this State are in eight-frame Langstroth hives, or in hives similar in size and shape. In general we may say that, the further north the beekeeper is located, the shorter his honey season. A short season requires a small hive for the best results in the production of honey; and a small hive requires the more constant care. A large hive will stand more neglect.

Our location is one where the surplus flow is early and quite short, it being mainly from clover and raspberry. This flow usually begins about 60 days after the first natural pollen is brought in. The best flow is apt to come after a rigorous winter, and then the skill of the expert is needed to bring the bees through in good condition, and tide them over the ever-changing days of spring. All admit that an eight-frame Langstroth hive is large enough to allow a colony of bees to build up to a normal size during this time when circumstances are favorable. Now, if it takes all the skill of the experienced beekeeper to manage his bees so they will come through the winter and spring in the best condition and take care of the surplus honey in general, what can be expected of the inexperienced, careless, or indifferent beekeeper? It is evident that the eight-frame brood-nest is ample for such, as there is no object in having more frames if the beekeeper is not able to get the colony built up safely to occupy them. The eight-frame is ample for the beginner; but when the knack of successful management is acquired, so that at least half of the colonies, by the time the honey-flow begins, fill their hives to overflowing with bees, a larger hive—that is, a ten-frame size—must be used. If the beginner were to start with a twelve-frame hive it would be

my opinion that he had begun at the top of the ladder instead of the bottom, and his failure would be almost certain. The change from the ten-frame size to the twelve-frame size may be advisable whenever one has mastered the situation, so that the ten-frame hive has become too small to hold his colonies at the opening of the flow. The location must always be considered in this connection; for if the main honey-flow began only 90 days from the time the first natural pollen is gathered, a hive with at least two more Langstroth-sized frames could be used than would be advisable if the main honey-flow began only 60 days after the first pollen was gathered in our location here.

Mr. S. D. Chapman, of Mancelona, Mich., is one of the most successful beekeepers in Michigan, as he has beekeeping "under his thumb." He winters his bees in four cellars, and brings them through the winter and spring very strong, so that, long before the 60-days breeding season is ended, he is obliged to allow additional room for the queen to lay, and also for clustering space in order to keep the bees from swarming before the honey-flow. Two of Mr. Chapman's cellars are under his dwelling house, a third is an elaborate special repository, and the fourth is one not so expensive. One of the cellars under the dwelling house is under a part of the house where a fire is kept going most of the time; and these colonies must be set out in the spring earlier than any of the others. All of this shows that the man and not the cellar should have the credit where the colonies are successfully wintered in four cellars of different design and construction, necessitating different methods of handling, etc.

Good wintering in the Northern States is one of the supreme tests of a successful beekeeper; and the inability of many of the northern men to winter their colonies so they will breed up and fill large hives in the short period between the breeding season in spring and the main flow in June is the reason that most of them prefer a small hive.

For 18 years I had 50 ten-frame Quinby hives in use. These were chaff hives with the regular thickness of packing around the sides, top, and bottom in winter; but the best I could do was to get the colonies in these large hives in condition for the honey-flow about July 1, when in our locality the white-clover flow would be nearly over. At the same time I was having good success with the thirteen-frame Gallup hive, and so I took out the two outside frames of the Quinby hive, reducing it to the eight-frame size, which equaled in space the thirteen-frame Gallup hive, except that the frames ran the other way. These two hives gave good

results, and I patterned after this same size when I adopted the ten-frame Langstroth hive.

I do not mean in any of the above that I prefer the eight-frame hive. It is true that I said that the eight-frame Langstroth hive is large enough, and some may wonder why I use the ten-frame hive. I will try to explain the reason. It sometimes happens that we do not see our colonies from the time they are taken out of the " clamps " until it is time to put on supers, and in such a case all must be fed enough in the fall to make a total of from 25 to 30 pounds of stores, to make sure that none starve during the spring when we do little if any feeding. Our colonies use from 20 to 25 lbs. of stores from October till the main honey-flow in June. At the time of the main honey-flow, there will be from 5 to 10 lbs. of stores left in the hives which have contained 30 lbs. in the fall, and from nothing to 5 lbs. in those hives which contained 25 lbs. in the fall, the calculations being based on good average colonies—weak colonies consuming less. Now, a Langstroth brood-comb contains 5 lbs. of honey and bee-bread when sealed; and 30 lbs. of stores will, therefore, fill six brood-combs spaced 1⅜ from center to center; so that in an eight-frame hive there will be only two empty combs left in the fall. A colony wintered fairly well in such a hive will become honey-bound before the main flow the following June. It would have been in better condition at this time if there had been a comb or so of stores left. On the other hand, the ten-frame hive with 30 lbs. of stores would have **four** empty combs in the fall; which combs, together with those from which the honey is used during the winter, would make ample room for the queen to lay and still allow a " reserve fund " consisting of a comb or more of honey at the beginning of the honey-flow in June. For this reason, therefore, we prefer ten-frame hives.

The size of a hive is much more important than the shape. A well-shaped hive is important only because it is more convenient for the apiarist. In outyards every hive should be the same, for a variety of sizes and shapes is an abomination. I have had experience with different sizes; but every one of my extracted-honey colonies is now in a ten-frame factory-made dovetailed hive, and every super is the same as the lower story or body, so that all are interchangeable. I use ten Hoffman frames in the bodies, and eight loose hanging frames in the upper stories, the eight frames in the ten-frame super making 1¾-inch spacing, so that all combs are bulged.

Mr. J. N. Harris, of St. Louis, Mich., has two or three outyards in the northern part of the State. A part of the colonies

are in eight-frame hives, and the rest in twelve-frame, these twelve-frame hives being the only ones I know of in the locality. Mr. Harris is an old veteran at the business, and he is very thorough in his work with his bees. For instance, every comb that he has is built from wired foundation; and if it happens there are too many drone-cells in any one comb, that comb is replaced with a full sheet of worker foundation. Now, if he goes to this trouble to keep his combs in good condition, it is evident that all the other work around the bees must be done in the same thorough manner. Since he winters the eight and twelve-frame colonies in the same cellar, and manages them through the season as nearly alike as possible, Mr. Harris is in position to tell which hive is the best to adopt with his system of management in his locality, especially as he has only one object in view—the securing of the most extracted honey with the least expenditure of labor and expense.

Mr. Harris says that colonies in the twelve-frame hives go into winter quarters with more bees than those in the eight-frame hives, and also that they come out much stronger in the spring. He has found that he can count on having about eight combs of brood in the twelve-frame hives, and only six in the eight-frame; so that the twelve-frame colonies have about 25 per cent more brood than the eight-frame. I wish Mr. Harris could have tested the ten-frame hive in connection with the eight and twelve frame, for it would seem to me that if he got 25 per cent more brood in the twelve-frame colonies than in the eight-frame, then the ten-frame hive with the same management should give him only one comb of brood less than the twelve-frame, and one more than the eight-frame. The best point in favor of the twelve-frame hive is that it is so large that he does not need to do so much "fussing" with them as with those in the smaller hive, and he is able to attend to more colonies, getting more honey per colony. He keeps all the colonies he can attend to himself, instead of depending on any help to care for a larger number. Mr. Harris has used fifteen and sixteen frame hives; but he could not see that they offered any advantage over the twelve-frame size, while they had many disadvantages.

Twenty-four combs filled with honey and brood will cost the same, whether coming from two twelve-frame hives or from three eight-frame hives; and there is not very much difference between the cost of the two twelve-frame hives and the three eight-frame hives. Mr. Harris says that he secures the same amount of surplus honey from three eight-frame colonies, which, at a given time previous to the honey-flow, have five combs of brood each, that he

secures from two twelve-frame colonies each having eight combs of brood at the same time before the honey-flow. Now, as he has said that he can produce six combs of brood in the eight-frame hive to eight in the twelve-frame, it will be seen that the eight-frame hive is still ahead, taking into consideration the number of frames in the hive. In other words, it would take fewer bees to gather the honey in a given locality in the eight-frame hive than in a twelve-frame. If I were selling bees I would ask about the same money for 60 or 65 colonies in twelve-frame hives that I would for 90 colonies in eight-frame hives; and the surplus-receptacles for each lot would probably sell for about the same.

The Langstroth frame being the standard, I think that eight Langstroth frames make a small hive; twelve make a large hive, and ten a medium one. Other things being equal, a two-frame nucleus in proportion to the number of combs it contains will store just as much honey as a colony in an eight-frame hive, and considerably more honey than a colony in a ten-frame hive, and, of course, much more yet than a colony in a twelve-frame hive. This comparison is based on the ability of the queen to keep the different sizes of hives stocked with eggs, and on the disposition of the workers to take care of the eggs and brood afterward. An ordinary queen will fill a ten-frame hive with brood; but it is rare that a queen will use all of the room in a twelve-frame hive. Bees on ten frames of brood will store the same amount of honey whether the brood is all in one hive or divided into two parts and in two hives. It will be seen by this that the number of combs of brood and bees we have at the beginning of the surplus-honey flow determines the amount of honey that will be brought in, regardless of the size of the hive. Generally speaking, the smaller the hive the more honey will be placed in the super.

After satisfying myself that the eight-frame hive was large enough for the average queen, I made up my mind to use the ten-frame hive, the two additional frames being principally for honey. Although these two extra frames may contain brood in some cases, they were usually filled with honey and comb—a reserve fund, so to speak; and with this reserve on hand our colonies will not have to be watched as closely in regard to stores, and are thus better equipped for outyard service, where they may be left by themselves at quite long intervals at times.

It is possible for the expert honey-producer to make a fair success with almost any size or shape of hive, and in almost any location; but it is very convenient to have the hive conform to the system that is best for the special location.

CHAPTER III

How to Buy Bees

HOW TO SELECT THE STRONGEST AND BEST COLONIES IN A YARD; HOW TO DETERMINE THE CONDITION OF A COLONY BY A GLANCE AT THE FLYING BEES AT THE ENTRANCE

In looking for colonies to buy it is well to select them from yards in the vicinity of the place where we expect to establish an apiary, if such can be found, for in this way no more bees are brought into the locality. This is a strictly business proposition, and the amount that one can afford to pay extra for colonies that are already within perhaps a mile of the proposed apiary is a little hard to tell. The number of colonies a location will support, and the number already there, are determining factors. If the beginner has any doubts as to whether the location will warrant its bringing in new colonies, he should buy them near home, even if the price is twice what it would be at a more distant point.

During my early experience in beekeeping there were a good many small apiaries around me, isolated from other yards, so that the bees had unlimited pasturage; and these few colonies in a place always gathered more surplus honey than those in the main yards where perhaps a hundred colonies were kept. The fewer bees in a given location, the larger the crop of honey, other things being equal.

In May of my second year with bees four more colonies were bought, which, with my two taken from the tree, made six at the beginning of the second season. These were increased to eighteen during that summer, though but very little honey was secured. If I were to chronicle all the mistakes I made that season I would fill Gleanings several times.

In the first place, when I had but the two colonies, a party was found who had bees for sale in Metcalfe hives, and, by returning the hives after the bees were transferred, the four colonies

were bought for $20.00—about twice what they would cost now. These were transferred to Gallup hives immediately after moving them home, which was during fruit-bloom in May, 1877.

A beginner, after finding bees for sale, would do well to have some experienced beekeeper go with him to select the colonies. This may not be convenient, and in many cases, perhaps, he will have to depend on his own judgment. It seems a natural thing for an inexperienced person to look for colonies heavy with honey, selecting them usually by lifting the hives or looking down between the combs. This, in connection with a good cluster of bees, would be the proper thing to look for if one were buying bees in the fall, when a long winter is ahead necessitating 25 or 30 pounds of honey to carry the bees over until the next honey-flow in June. However, in the spring, during fruit-bloom, when the main honey-flow is only three or four weeks away, it is not honey that one should look for, but large clusters of bees, and combs at least two-thirds full of brood. There should be, of course, about ten pounds of honey to last the bees until the opening of the main honey-flow the next month.

In a yard containing as many as 25 colonies one may find them in all conditions, from a mere handful of bees to those very strong. These latter are the ones that will do the work in the supers, the smaller ones doing nothing, perhaps, but building up in shape to winter again by the next fall. Then there are queenless colonies that no one wants at any price. How to select these rousing colonies instead of the small ones is worth considering. Experienced beekeepers can tell by the indications at the entrance which colonies are strong, which medium, and which are weak.

HOW TO SELECT GOOD COLONIES WHEN BUYING FROM EXAMINATION AT THE ENTRANCE

To select the colonies, go into the yard during a good day for the bees to fly, and walk down past the hives, noting the flight of the bees. During fruit-bloom is a good time to buy, for the strong colonies will then have a good flying force, and the bottom-boards will be free from obstructions, showing that the hive contains a large number of strong workers that are through house-cleaning for the spring.

One of the very best indications of a good thrifty colony at this season is the amount of pollen the bees are carrying in. This is carried on the legs of the workers, and can be readily seen as they enter the hive. I have talked with people who believed this pollen to be the wax that the bees use in building comb, and that

they had gathered it somewhere for this purpose. Pollen is the dust, or fertilizing agency, produced by the flowers. It is mixed with honey by the bees, making a doughy substance called bee-bread, which is used for feeding young bees still in the cells; and with the hive full of only young bees to feed, much pollen is needed. It goes without saying, that the hives into which bees are carrying lots of pollen contain colonies strong in bees and heavy with brood.

Queenless colonies can be told by their lack of energy at the entrance. The bees have no brood to feed, and no pollen to speak of is needed; and although an occasional bee will be seen loaded with pollen, it will be noticed that something is wrong, for they all lack the energy of the bees belonging to colonies in a normal condition. Fortunately there are but few queenless colonies in this condition at this season of the year. They usually die earlier in the season.

After deciding from the entrance indications which are the desirable colonies to buy, the combs should be examined to see that they are straight in the frames, and that there is a good percentage of worker cells. At this time, also, one can make sure that the colonies are strong in brood and bees, for it will not do to depend entirely upon the entrance indications, although in this way one can save the time taken in looking through a great lot of weak colonies before finding the more desirable ones.

Many beekeepers, nowadays, hive their swarms upon full sheets of foundation; and if any can be found having combs built in this way, it would be a good plan to buy all such; for, by so doing, good straight worker comb can be secured. Those who profess to be beekeepers at all, use at least a strip of foundation in the top of the brood-frame to start the bees building the combs true in each frame. If starters are used in the frames of the hanging type, the combs containing a large percentage of drone-cells can be taken out and replaced with new frames containing full sheets of foundation.

MOVING BEES HOME

After buying the bees they will have to be moved home: and if the moving is done with a team, bolster springs should be used in the wagon; but if these can not be had, some straw in the bottom of the regular wagon-box will do to set the hives on, this straw to take off some of the jar caused by the wheels moving over stones or rough places. Last summer we moved 160 colonies without springs or straw, and we crossed two railroads where the

road was very rough, but not a comb was broken. If colonies have been in the hives two or three years, so that the combs are old and tough, such combs will stand a great amount of hard usage without breaking. After one has moved colonies by rail, and learned how much knocking combs stand without breaking, he will not be so worried about breaking them when moving with a team.

To prepare strong colonies for moving, nail wire cloth over the entire top of the hive; fasten the screen on with pieces of lath; nail a strip of lath also over the entrance, as the bees will have all the ventilation they need through the top for so short a haul. If the hive has a loose bottom-board, this should be nailed securely. We go early enough in the afternoon to the yard to be moved to nail on bottoms and screens while the bees are still flying. Then toward night, after the flying is over for the day, a piece of lath is nailed over the entrance. The hives are then loaded on the wagon and drawn home in the night. After placing them on the stands that they are to occupy permanently, the entrance-blocks are removed immediately. Never keep bees confined in the hives a minute longer than is really necessary. There are many reasons for this that can not be given here.

CHAPTER IV.

Folding Sections and Putting in Foundation

When folding sections, if any noise is heard, as of the wood breaking at the V groove, the section is too dry, and the whole stock sholud be dampened before more of them are folded. Even if the wood is not dry enough to break entirely at the V groove, it is weakened if this crackling noise is heard, and will always be fragile.

When the wood is in just the right condition the section should fold without a particle of breaking at the point where the V groove cuts nearly through. If the work is done during the wet season or early spring, especially if the sections were kept in a room where there was no fire, it is probable that no dampening will be necessary. If this wood is not in the right condition, however, all of the sections must be dampened to prevent breakage or frail corners.

There is quite a knack in dampening sections so that they will be perfectly square when folded. It is very necessary that

the section, when folded, shall be square on account of the full sheets of foundation to be put into them, as will be explained later. At one time we poured hot water from a tea-kettle into the V grooves of the sections before removing them from the crate. We placed the crate on edge and removed the side in order to expose all of the V grooves so that the hot water from the kettle could follow clear through all of the five hundred sections. We found that this method caused the sections to swell to such an extent that they could hardly be bent around sufficiently to get the notched ends together.

HOW TO DAMPEN SECTIONS SO THEY WILL FOLD PROPERLY

If the weather is dry, as it is likely to be in summer, or if there was a fire in the room where the sections were stored, the folding can not be properly done unless these sections are dampened. To do this, remove enough of the crating to expose all the V grooves in the outside layer of sections, and then group the crates together and cover them with a wet blanket, which has been wrung out so that no water can drip from it. The next morning the sections will be in first-class shape to fold.

The above method is the one to follow during a very dry time in summer, or whenever the sections for any cause are bone-dry. Very frequently sections need but little dampening to be in good condition; and in such cases a little water should be sprinkled upon a dry blanket, using judgment as to the amount needed. A little experience along this line will make everything work nicely.

FOLDING SECTIONS

To be sure that the sections will be square after they are folded, a section-press is essential. This device forces the notched ends of the section together while every corner is held true and square. Properly made sections put together with a press of some good make will give very little trouble about being diamond-shaped, etc., especially if the directions for dampening, as given above, are closely followed.

The folding of the sections and the putting in of the foundation determine to a great extent the quality of the honey that is to be produced. There is entirely too much of the ordinary kind of comb honey on the market, and the price is so low that there is absolutely no profit in producing it. Extra good comb honey should be produced, and then a good fair price asked for it. During the season of 1906 the writer produced comb honey that retailed at 33 cents a pound, and at the same time there was con-

siderable comb honey on the market that could be bought for one-third this price. It did not cost very much more per pound to produce the better grade, and it therefore is plainly evident which was the more profitable—the 11-cent or the 33-cent grade.

PUTTING IN FULL SHEETS OF FOUNDATION

A diamond-shaped sheet of foundation will not fit a square section. The piece should be cut with the corners perfectly square, and wide enough so that it will slip into the section without crowding. The piece should not be so deep as to come nearer than a plump quarter of an inch from the bottom of the section when fastened in. The piece must hang true in the center of the section, or the best results can not be attained. The test comes when the section is squared up when placed in the super; for if it is diamond-shaped the foundation will be thrown over against one side when the sections are squared up, for one edge of the foundation striking the side of the section will throw the other lower corner against the separator. The section does not have to be very much out of true for this to take place, and such a section is a complete failure so far as comb honey is concerned, for it will never be salable when full. This is, perhaps, an extreme example, but nevertheless many sections are given to the bees in just this condition.

One of my acquaintances kept a pair of shears near by; and when he found a full sheet of foundation striking the wood near the bottom he sprang the piece out far enough to clip off enough so that it could hang straight. This will prevent irregular combs, but it is a makeshift, and should be adopted only until one acquires the knack of putting up the sections and full sheets of foundation so that they are square in the first place.

A section can not be filled too full of foundation at the sides, and good results will always be attained providing the sheet does not touch the wood. However, as mentioned before, there should be at least a ¼-inch space between the bottom of the foundation and the bottom of the section. This is to allow for the sagging of the extra-thin foundation used. Foundation must not sag enough to touch the bottom of the section until quite well drawn out by the bees, or there will probably be trouble because of buckling, and buckling is just as bad as the condition which makes the foundation swing over to one side against the separator.

If the beginner will bear in mind the fact that the foundation must hang true in the center of the section, no matter whether fastened by a hot plate or by melted wax, much of his trouble in

putting in foundation will disappear. With either method the foundation can be made to hang in the center providing time enough is spent on the work.

THE MELTED-WAX PLAN OF FASTENING FOUNDATION

I am very sure of one thing, and that is, that better work can be done with the melted-wax plan of fastening foundation into sections than with the hot-plate machines. One bad feature about the melted-wax plan, however, is having the melted wax around. We have never put in enough foundation on the melted-wax plan to acquire the dexterity that we should. I presume some will always use one plan and others the other.

Last summer we put in some foundation on the Yoder plan described in the April 1st issue of 1908. As will be remembered, the Yoder plan consists in fastening the foundation with melted wax, not only across the top of the section but also one-third of the way down the sides from the top. Every section put up in this way produced a perfect section of honey so far as the foundation was concerned. With foundation fastened one-third of the way down the side of the section, most of it is apt to be a little curved, due to the expansion when it is warmed up by the bees. Some of the sheets were curved perhaps half an inch; but when the honey was finished there was nothing to indicate that the foundation had not been in the center of the section. Somehow I can not help thinking that there would have been a little more work done in the supers if the foundation could have been kept true in the center.

About the only tools needed for putting in foundation on the Yoder plan is a wax-tube. There should be a square block a trifle less than half the thickness of the section, and just large enough to fit inside. This block should be perfectly square, as the section must be held square when putting in the foundation. The block should be nailed to a thin board a little larger, and, for convenience, a handle should be nailed to the back of it. The foundation must be accurately cut just the size of the inside of the section, less the ¼-inch space at the bottom. To put in the foundation, the section should be placed over the block before mentioned, and the sheet of foundation put in place pushed close to the top. The block should be held in such position as to form a trough made by the sheet of foundation and the side of the section, and then some melted wax dropped at a point one-third of the distance from the top of the section now held at the bottom. By turning the block around, the wax can be made to run down and around

to the other side, and finally to a point one-third of the distance from the top. To work to good advantage, two or three of these blocks are necessary, as the wax should cool before the sections are removed.

PUTTING HIVE PARTS TOGETHER

Some time previous to the surplus-honey flow, hives and supers should be nailed and painted, sections folded, filled with foundation, and arranged in the supers ready to be put on the hives when the time comes. Everything should be in readiness, as a little delay in giving room, when it is needed, may be the means of cutting the surplus-honey crop in two.

NAILING HIVES

Hives and supers, as they come from the factory, are provided with nails, etc., and in putting them together the only tools required are a hammer and a square. A carpenter would probably have a wooden mallet to use in driving the dovetailed corners together, but a hammer can be used for this purpose, although the planed surface of the wood should never be struck, as it would be marred. A piece of tough wood should be secured that will not split easily, and this placed on the corner to take the blow from the hammer. Before nailing the hives they should be squared; for if they are not made square before nailing, they will never keep so afterward.

HOW TO ASSEMBLE HOFFMAN FRAMES

While instructions usually go with each shipment of hives, many do not understand putting together Hoffman frames. The beginner should take particular notice of the directions that go with each crate of frames, and see that the V edge and the square edge of the end-bars are on opposite sides. As the frame is held up, as one would hold it when looking for a queen, the square edge should be at the right end of the frame and the V edge at the left. Frames so assembled will go into the hives either way; in fact, they can not be put in wrong.

Two years ago I bought a lot of colonies in hives in which the frames were nailed wrong; that is, many of the frames had the V edges of the end-bars on the same side. This meant that the V edges would come together in the hives and the end-bars would often slip by each other, making the space too narrow between those two particular frames.

WIRING FRAMES

After the brood or extracting frames are nailed, they are ready to wire. We always order our frames pierced and the wire included. We wind this wire on a board three inches longer than half the length of wire that we want to use. The wire is then tied in about four places with a good stout string and cut at one end of the board with a pair of tinner's snips. Each piece of wire will then be about six inches longer than necessary for the frame, the extra length being for convenience in handling. The strings keep the wire from snarling, and yet allow one wire to be drawn out without disturbing the others.

To wire the frame, we drive in the end-bar two of the little ⅜-inch nails that come with the frames, one near the upper hole and the other nearer the lower one. These are driven only half way in. One end of the wire should now be run through the second hole from the top of the frame across the frame to the corresponding hole in the opposite end-bar, then up to the upper hole in that end-bar, and back to the upper hole in the first end-bar. This end of the wire is now wound around the nail, and the nail driven home. This completes the wiring of the upper half of the frame. The other end of the wire should now be threaded through the lower sets of holes in the same way; but before the end is finally fastened the slack should be taken out of the wire.

For many years we threaded the wire into the frame right from the spool, carrying one end through all of the holes in the frame, but the method given above is much the better of the two ways.

HORIZONTAL WIRING DOES NOT PREVENT FOUNDATION FROM SAGGING

After wiring thousands of frames horizontally, some with the wires drawn tight and some loose, we have found that the foundation sags about so much any way; and if no provision is made for this sagging it "buckles," making the irregular combs that all are familiar with who use full sheets of foundation. The heavier the foundation, the less sagging; so that I now use the medium brood in brood-frames, although the light brood is all right in extracting-frames. As the weight of the foundation must be relied upon to prevent sagging, our frames are now wired loosely in order to hold the foundation in the center of the frame without the buckling that is more likely to be found in tightly wired frames.

PUTTING FOUNDATION INTO THE FRAMES

This work should always be done in a warm room or where the temperature is high enough so that the foundation will be pliable and not easily broken in handling. Our brood-frames are all ordered with the double groove and wedge for securing the foundation in the top-bar. The full sheet of foundation should be laid on the wires, worked into the center groove, and then the wedge inserted in the other groove. Right here is where so many fail, for they do not crowd this wedge in far enough. This is quite important, for a little carelessness in doing this will mean that the foundation will fall out of the frames and make a complete failure of one of the best means of securing it ever devised.

IMBEDDING WIRES INTO FOUNDATION

We use a smooth planed board, ⅞ inch thick, and the size of the inside of the brood-frames. We lay this board on the foundation now in the frame, and turn the frame (board and all) the other side up. The wires will then be on top of the foundation, and the board on the under side. We have never tried anything that equals the Easterday imbedder. It is not quite as rapid as the spur-wheel imbedder, but, unlike the latter tool, it leaves the foundation smooth instead of creasing it and making a weak place. After the wire has been crowded down into the foundation a few drops of wax near the ends will help to keep it in place.

The lower edge of the foundation should be trimmed off in order to leave about a half-inch space just above the bottom-bar of the frame. We take a narrow board the length of the inside of the frame and ½ inch thick. We use this board as a guide for trimming off this lower edge of the foundation. We stand it on edge next to the bottom-bar, and with a thin sharp knife cut off that portion of the foundation by means of the straight edge thus afforded. If the space between the foundation and the bottom-bar is much less than half an inch the foundation is likely to sag; and when this happens it tips over to one side (buckles), and makes one of the most undesirable combs imaginable.

PAINTING HIVES AND SUPERS

In the spring, after most of the freezing weather is over, we do our painting. We have had a long experience with lead and oil, and also with prepared paint; but we use only the prepared paint now. A new hand can do good work by using prepared paint, while the mixing of lead and oil is a trade in itself. Even the prepared paint, however, should be thoroughly stirred before

it is used. We use nothing but white paint on our hives and su pers, and we make sure that the paint contains nothing but pur lead and oil, although some of ours has a little zinc added also, t be used as a last coat to give a hard glossy finish. We buy th paint in one-gallon pails, and then use an extra two-gallon pai besides. The paint is well stirred, and poured from one pail to th other until it is thoroughly mixed. For the priming coat two o more quarts of oil can be added to the gallon of paint, before stirring, to thin it. Buy paint marked for outside use, and thin the first coat with raw oil.

There is a knack in applying the paint, for it should be rubbed well into the wood. Apply several thin coats rather than fewer thick ones. The same amount of paint is much better applied in three thin coats than in two thicker ones. For the second and third coat not much oil will be required in thinning the paint usually found on the market; but if it appears rather heavy a little oil should be used, especially when the pail becomes nearly empty. Each coat should be allowed to get thoroughly dry, of course, before another is applied.

HOW TO HANDLE BEES WITHOUT BEING STUNG; THE USE OF SMOKERS; TRANSFERRING

The beginner is likely to use too much smoke or else not enough, for the different dispositions of colonies are often confusing, and the amount of smoke needed to subdue one colony will often drive a more sensitive lot of bees out of the hive. More smoke is necessary during a honey-dearth than during a bountiful flow; but this additional amount of smoke must be given in smaller though more frequent doses. After removing the cover from the hive, and smoking the bees so that most of them run down between the combs, the first frame may stick in the hive so that it is finally lifted out with a snap or jerk, causing some of the bees to fly at the hands as if they would sting. In this case a more experienced beekeeper would have noticed that the bees were ready to sting before any of them had taken wing, and he would have given them just a little smoke. The smoke should never be blown clear down into the hive, causing the whole colony to stampede, for it is then much more inconvenient to do the necessary work. There should be just enough smoke to drive down those bees that are on the tops of the frames; then at any time when a bee is seen about ready to take wing, as if to sting, a very little smoke is needed again. In time one learns to use the smoker just before there are any bees in the air.

The careless handling of bees causes many stings. There is rarely a season but that we have some inexperienced help in our yards; and the first advice we give a beginner is that, if there should be an accident, such as the dropping of a frame of bees, or if in any way the bees get the best of the situation, he should retreat until they are quieted down. Then with a smoker well going he is to go to the hive and subdue them. In such cases, where there has been an accident, and bees killed or combs broken, the work becomes more complicated, for many of the bees are likely to take wing when smoked, and be in a stinging mood while in the air. Under these circumstances we alternate between smoking the bees in the air and those in the hive until most of the flying ones have settled down; then the work proceeds where it left off. It is a little humiliating to run from a colony of bees that one is handling; but beginners often have trouble, so that I am obliged to tell them to go into the honey-house until the colony becomes quiet.

One of the most serious accidents that ever occurred in our yards was when honey was being removed. Our new helper, not having had much experience, did not make sure that the frames in the lower story were cut loose from those in the super, so when he attempted to lift off this super two of the lower frames were lifted up with it. Not knowing what was the trouble, the super was lowered on the hive and a second attempt made to lift it off without giving any more smoke. By this time many bees had been killed, and there is nothing that will so enrage bees as this. We noticed the predicament and ordered a retreat, otherwise there would have been a case of hard stinging. An experienced beekeeper, after lowering the super back on the hive, would have smoked the bees well and then have made sure that the two sets of frames were entirely separate before a second attempt was made.

A beekeeper who does not know how to use smoke, or who does not take the precaution to work carefully, will always have cross bees. I have been in yards where the bees were so cross that it was almost impossible to stay there a minute without having protection for the head and hands. In other yards of bees of the same strain, and under the same circumstances, one could work all day with no protection whatever, and still receive no stings. The difference is all in the intelligent use of smoke and in the careful handling of the bees.

HOW TO TRANSFER

I have told of buying four colonies of bees in Metcalfe hives. Ordinary Jumbo frames would be similar to those in these Met-

calfe hives if they stood on end. In other words, the top-bars were shorter than the end-bars. The combs were fairly straight in the frames so that they were much easier to transfer than if they had been built in box hives, or crisscross, as they sometimes are in frame hives if no starters are provided at the top of the frames for guides. When ready to transfer a table should be secured, preferably in a honey-house away from robber bees. A bottom-board should be in readiness also to lay the combs on that are to be transferred to new frames. Blow a little smoke into the entrance of the hive to be transferred, and remove the cover, giving a little smoke also over the tops of the frames. As the work progresses, there is apt to be more or less jarring of the hive, and more smoke will be needed, so the smoker should be kept in good condition and in a convenient place where it can be had at a moment's notice.

As it is a frame hive that is being transferred, pry the frames apart so that the first comb may be easily removed, and then shake most of the bees from it in front of the hive, brushing off, with a Coggshall bee-brush, the few that remain. In the case of box hives it is usually necessary to pry off one side of the hive and then cut out the combs to be transferred. Since the combs are not usually attached to the bottom of a box hive it is well to turn it upside down and remove the bottom-board. Then with a long knife cut the combs loose from one side of the hive and remove that side. When the combs are built in cornerwise I remove two sides of the box so that they can be taken out easily.

When the combs are free from bees, place them, one at a time, on the board in the honey-house and lay the new frame on top of it in order to get the exact size. A thin case-knife is the best tool for trimming the combs. They should be cut just a little larger than the inside of the frames so that they can be crowded in. The frame containing the comb may then be turned on edge by tilting up the board (frame and all) to keep the comb from falling out until the frame is vertical. Then wrap comb and frame with fine wire; and when the bees have the comb well fastened in the frame, some time afterward, this wire may be cut along the top-bar and pulled out without removing any of the frames.

As soon as one new frame is filled with old comb it is placed in the new hive, which should now stand where the old one did, the old hive being moved a rod or so to one side. From this time on, all of the bees should be brushed into the new hive; and when all the combs are transferred, the bees that are left in the old hive can be dumped before the entrance of the new one. One will

usually get from four to six worker combs from an old hive, and the rest of the space in the new hive should be filled with frames containing full sheets of foundation. It would not do to use frames with starters only, for the bees would build drone comb, as will be explained in a further article.

The above plan was the orthodox method of transferring at the time I began beekeeping. Since then we have used other and better methods.

A MODERN WAY OF TRANSFERRING WITHOUT CUTTING COMBS

In modern methods of transferring bees from box hives, or from any undesirable hives, for that matter, none of the old combs are used in the new hive. With a good press, nearly all the wax can be obtained from the old combs, so that full sheets of foundation may be substituted in the new hives; and, of course, the combs drawn from such full sheets of foundation are vastly better than old patched-up pieces of combs taken from old hives.

During late years we have done none of our transferring until the beginning of the clover-honey flow in June. Mr. A. H. Guernsey, of Ionia, Mich., has successfully practiced for several years the following plan:

At the opening of this clover-honey flow, or as fast thereafter as the colonies to be transferred get strong and have their hives full of honey and brood, the cover is removed from a colony to be transferred, and a full set of good combs placed in a hive-body and set on top. The next step is to go to a colony that has brood in all stages, and select a comb, perhaps half full of brood. This comb should be one that the queen is laying in, and also one on which cells are started, but not yet occupied with eggs. The bees should be shaken off this comb, care being taken to see that the queen is left in her own hive. This comb may now be exchanged for one of the central combs in the new body that has just been set over the hive containing the colony to be transferred. After about three days, in the warmest part of the day, carefully remove this comb of brood before mentioned and look for the queen. If she is not found, look every day until she is found, and then place a queen-excluder between the two bodies, the queen being in the upper story. In 21 days the lower body can be removed free from brood, the sides knocked off, and the honey and wax saved.

Full sheets of comb foundation might be substituted for the combs in the new hive, as mentioned above, but the bees would

be slower in going up into the new body if this were done, and more honey would be left in the hive below. If the cover to the old hive is found nailed on when preparations are being made for transferring, the whole hive can be inverted and the new body containing the combs placed over it.

This transferring may set the colony back a little, but not very much after all, and it is necessary to watch the transferred colony with the rest and give super room when needed.

With the plan that I practice myself, I secure a full crop of comb honey, although the transferred colony may need some help along the line of winter stores. My plan is as follows: A super is placed on the hive to be transferred, just as on any other hive (if the old hive has the cover nailed on, it is inverted). The colony is then left until it casts a swarm, which is hived on the old stand where the old box hive formerly stood, and the supers of sections shifted to the new hive. The old box hive may then be carried away to another part of the yard. The actual transferring in this case is done 17 days later, at which time the parent colony should have a laying queen; and, since the queen before the colony swarmed did not lay very much during the last four days before the swarm issued, there will not be much brood but what is hatched at the end of these 17 days. By this time it is, very likely, near the close of the season, so that it does not pay to wait for the few bees that might yet hatch from the combs; and it is better to allow the young bees already hatched to get to work in their new quarters. A new hive filled with combs of full sheets of foundation is placed where the old box hive last stood, and the side of the box pried off, the combs cut out, and the bees brushed in front of the new hive.

Last season some of the old combs left in the box hive were run through a capping-melter, and the honey and wax separated much more quickly than we ever did it before.

Colonies transferred so late, or late swarms of any kind, ought to be hived on empty combs when possible; but if there are no combs, so that one must use foundation, no more frames should be given than the bees can finish before the close of the flow. There was a reason for not leaving the foundation in the hive during a dearth of honey, for the bees, having nothing else to do, seem to take delight in gnawing it, for to them it is unnatural. After a sheet of foundation has been in the hive three weeks during a dearth of honey it is almost ruined.

THE CONDITIONS UNDER WHICH BEES BUILD STRAIGHT WORKER COMB FROM STARTERS

Although we use and recommend full sheets of foundation in wired frames, it may be well to consider how and when one can get along with starters only in brood-frames, as some may not want to use full sheets.

Bees build two sizes of cells in their comb-building. The larger size run about four to the inch, and are used for rearing drones and sometimes for storing honey. The smaller cells run about five to the inch, and are used for rearing workers and for storage. The beekeeper should strive to get all-worker combs built; for, in spite of all the care that can be taken, more than enough drone comb usually appears. Of course, in case of an extra-fine colony that one desires to breed from, a solid drone comb can be given in order that there may be plenty of drones of this desirable stock in the yard.

It is a fact that bees under certain conditions build almost all worker comb; and it is also true that, under other conditions, a great deal of undesirable drone comb is built. For instance, a new medium-sized swarm, placed in a hive of a size that may be filled with combs and brood in about 23 days or less, ought to build worker comb mainly, although some of the last combs built may contain a few drone-cells. The secret seems to be in having just the right number of workers and just the right amount of honey coming in, so that the bees will draw out the combs no faster than the queen can occupy them with brood. As long as this condition lasts we should expect the bees to build worker combs. From this we see that, in order to get good results in comb-building from a natural swarm, this swarm should be of just the right size, and there should be a honey-flow of, say, three or four pounds a day.

We will suppose a large swarm is hived during a period when honey is coming in freely. At this time there is too much honey coming in for the best results in comb-building in the brood-nest, if the whole force of workers is compelled to do all their work in the brood-nest. The remedy is to put most of the workers at work in the supers. Most beginners fail in doing this; but the principle is to make the surplus receptacles more inviting to the workers than the brood-nest, and the bees will immediately go up into the supers on being hived. Our comb-honey super with extracting-combs at the sides makes an ideal arrangement for this very thing.

It is plain to see that, if most of the honey being carried in is placed in sections, where it should be, the queen will not be

hurried to keep pace with the workers, consequently nearly all-worker comb will be built. The brood-nest should be filled with comb during the first 23 days after the swarm is hived, for the queen must keep up with the workers and lay in nearly every cell as fast as it is drawn out, or the bees will begin to store honey in the cells. When this condition arrives, the bees, on the supposition that the queen has reached her limit, and that the rest of the combs will be used for storing honey, begin to build the storage size or the drone-cells in the brood-nest. This is likely to occur in about 23 days after the swarm is hived; for by this time the brood is beginning to hatch out in that part of the hive where the laying began. From this time on, the queen has nearly all she can do to keep the cells filled with eggs where the young bees are hatching. This means that the comb-building part of the hive is neglected, and that the bees build store or drone comb to a great extent until the hive is filled.

It sometimes happens that a very late swarm will issue; and since the season is nearing its close, it is not possible for such a swarm to build more than five combs before the honey ceases coming in. We hive such swarms as usual, and in about two days five of the frames having the least combs built are removed and a division-board placed up against the remaining five frames, this five having been shoved over to one side of the hive. If a super is given such a swarm at the time of hiving, it must be a nearly finished one, as the bees will need most of their time to finish up the five combs in the brood-nest. If one has two of such five-comb colonies they can be united at the close of the season, so that there will be none but full-sized colonies to winter. A better plan than this for late swarms, or for any small after-swarms that one may have, is to hive them on full sets of combs taken, possibly, from hives in which colonies died the previous winter. This is a very good way to get such combs filled with bees, but some swarms hived in this way may need feeding for winter.

There are artificial ways of handling bees so that they will build good worker combs. I refer to the plan of shaking the bees into an empty hive, in the same way that a swarm is hived. If a colony is divided into nuclei of, say, two or three combs each, and each nucleus given a young queen reared the same year, such little colonies will build very nice worker combs; but the beginner will not be interested in this artificial way of making increase, for he should stick to the natural-swarming plan for his increase until such time as he has had experience and made a success of getting

a crop of honey. In fact, there are many things to be learned before a beginner should take up artificial ways of making increase.

It is just a question in my mind whether there is a better or more profitable way of making increase in the production of comb honey than the natural-swarming method. In extracted-honey production, when the bees will not swarm enough to make up the winter loss, then artificial swarming must be resorted to.

SOME CONDITIONS WHERE BEES BUILD MOSTLY DRONE COMB

Any colony found rearing drone brood in the brood-nest will, if a comb is removed and an empty frame put in its place, build drone comb. It can be depended upon, moreover, that a colony of bees wintered over, containing a queen reared the season before, or one older, will build drone comb until the time it swarms. By this it can be seen that it is necessary to replace any combs, removed from a colony before it swarms in the spring or early summer, with an empty comb or with a frame containing a full sheet of foundation, or else drone comb will be the result. To be sure that a colony will build a large per cent of worker comb it is necessary to remove all the brood and to cause the bees of that colony to begin all over again, as in the case of natural swarming; or, as mentioned before, the colony can be broken up into nuclei, each nucleus containing a young queen.

CHAPTER V

What to Do Just Preceding the Honey-flow

THE IMPORTANCE OF HAVING PLENTY OF STORES TO LAST UNTIL THE MAIN HONEY-FLOW BEGINS

Immediately following fruit-bloom there is an interval of about three weeks before the clover-flow, when there will probably be no honey coming in in the Northern States; and at the beginning of this interval, providing the weather has been favorable, so that the bees could work on the fruit-bloom, the hives are heavy with brood. If the beginner will remember that, during the three weeks preceding the honey-flow from clover, there will be more brood in the combs than at any other time in the year, and that nearly the whole force of workers that gather the surplus-honey crop are reared during the six weeks preceding the clover season, he will better understand what I shall have to say a little later.

The conditions favorable to brood-rearing during the six weeks preceding the clover-flow are very important; but I think I am safe in saying that not half the colonies in the country are provided with these favorable conditions. Every good colony should have at least 12 pounds of honey in the frames for breeding purposes at the end of fruit-bloom. Colonies medium in size, that is, those light in bees and brood, may need less. To tell how much honey there is, there is no sure way other than to lift out the combs and make an examination. It can be depended upon that a brood-comb spaced 1⅜ inches from center to center will contain, when sealed, fully 5 pounds of stores. A part of these stores will consist of bee-bread, so if there are three combs of stores in the hives containing the best colonies at the close of fruit-bloom, such colonies will be in the ideal condition that we so much desire, and there will be nothing further to do with them until the time arrives for putting on the supers. One comb of stores may carry a weak colony over this period, and two combs will be sufficient for medium colonies. The ten-frame hives prove to be of advantage here; for, although there is room for plenty of stores, enough space is left for brood-rearing besides.

It is probably true that, in a colony of bees in normal condition, the workers do not become field bees until they are seventeen days old. By " normal condition " here is meant a colony having enough field bees to keep the nurse bees (those under seventeen days old), busy taking care of the nectar that is brought in, building comb, etc. If often happens in the clover belt, especially in the Northern States, that the honey season begins before many of the colonies reach this normal condition, especially if the winter was long and severe. In such cases many of the bees must go to the field in search of nectar long before they are seventeen days old; and as soon as the colonies get started in earnest they become normal, because enough of the bees have been forced into the field through necessity to make a balanced force, so to speak.

Since the old bees that winter over die off in April and May, a large number of young bees must be reared during the spring months to replace this loss. This is the reason why there must be an abundance of stores at all times during this heavy breeding season. The ideal way is to feed all colonies that are short of stores in the fall, and if, for any reason, some of the colonies become short of stores during the spring months, combs of honey saved for this purpose should be given. If no such combs of honey are available, the Doolittle or Alexander feeders may be used. For spring feeding the grade of honey is not so important, and it should be mixed with an equal amount of water by weight to make the syrup. For the fall feeding, only granulated sugar should be used, and the syrup should consist of two parts of sugar to one of water by weight. With plenty of stores in the hives, as mentioned first, no spring stimulative feeding will be found necessary. The beginner especially should avoid conditions which make it necessary to feed for stimulative purposes or even the exchanging of combs to equalize the stores. Such spring "fussing" should not be attempted by the novice, and it is a question whether even the old hand at the business will gain much by such management, or whether the colonies will be in better condition than they would be if provided with plenty of stores in the fall to last until the opening of the main honey-flow the following season.

THE DANGER OF ROBBING IN THE SPRING; HOW TO STOP IT AND HOW NOT TO STOP IT

The danger of robbing is enough to discourage any one from opening the hives during the spring months except when it is absolutely necessary during that part of the year. The apiarist

himself is responsible for nine-tenths of the robbing. In the first place, poor methods of wintering result in weak colonies which are not able to defend themselves against the stronger ones. Beginners, not knowing about this, are apt to handle colonies indiscriminatingly during the spring months; and if the ever ready robbers get a taste of the stores of honey, robbing will be started. The weak colony that was being handled is in poor condition to defend the stores, even if the bees had a disposition to do so. Our beginner may not have noticed that the colony was being robbed until there was a great uproar at the entrance of that particular hive; and at this point he is likely to do the most unwise thing possible; that is, to move the colony to a cellar or honey-house with the idea of saving it. It would have been much better to let the robbing go on until night, when all would be quiet, and then the robbed colony could be set over a moderately strong one, which would be abundantly able to defend the stores. There is apt to be trouble with the robbers, even when this is done, as many of them will stay over night in the hive that was being robbed, and will try to make an attack the next morning. If this weak colony had been placed over another weak one, the probability is that both would be robbed the next morning, and for this reason it should be placed over a fairly good colony, as stated before.

After the weak colony has been placed over a strong one, an empty hive-body, as near like it as possible, should be set on the old bottom-board, and the cover that formerly was on the weak colony put over it. Most of the robbers will be attracted to this place the next morning, and they will rush into the empty hive instead of attacking some nearby colony, thus starting the robbing all over again.

With a good deal of satisfaction we sometimes exchange the places of the two colonies—that is, the one doing the robbing and the one being robbed; but the plan does not always work. Only last spring we tried this with two of our colonies. The one that was being robbed had enough bees so they should have defended themselves, but for some reason they did not. We exchanged the places of the two colonies, but it was not long before the bees of the strong colony found out the change and began carrying the honey from the weak colony back to their own hive now on the new stand. The beginner should not attempt to adopt this plan of stopping robbing, for often those with considerable experience can not distinguish which colony is doing the mischief.

It is a good plan to contract the entrances in the spring to conform to the size of the colonies. In this way, not only the heat is retained but the bees in the weak colonies are usually able to defend themselves. When the entrance-blocks have been thus adjusted they should not be disturbed until some of the strong colonies need larger openings.

If the beginner would go into a beeyard and find robbing going on, his first thought would be to contract the entrances of the weak colonies. This might be the wise thing to do; but robbers are in the air that have secured a taste of honey from some source, and they are watching for a chance to secure more. If any one were to light a smoker and go into the yard with the air full of robbers, such robbers would very likely be attracted, especially if the guards at the entrances of the weak colonies were smoked so that the blocks could be adjusted. Therefore, if any change must be made with such weak colonies it should be made at night, when the bees are through flying for the day, so that all will be quiet the next morning.

Of course, when the honey season opens later on, such trouble with robbing quickly disappears, for bees do not rob each other to any extent when they can get nectar from natural sources.

CHAPTER VI

Strong versus Medium Colonies at the Opening of the Harvest

HOW A COLONY MAY REACH MATURITY TOO EARLY FOR THE HARVEST, AND THUS DEVELOP THE LOAFING AND SWARMING MANIA; THE DOUBLE-STORY TEN-FRAME HIVE FOR THE PREVENTION OF SWARMING, AND THE BUSY MAN WHO HASN'T THE TIME TO EQUALIZE BROOD

[" The ideal colony must not be over-populous. A hive is over-populous when its working force is too great in comparison to the dimension of the hive and to the number of wax-building bees.

" Such a condition is intolerable to the bees and they try to help themselves by loafing. Their instinct teaches them to begin this loafing even before the hive is over-populous. The bees seem to see the combs are filled and capped, that the bees are daily hatching, and that they will soon be crowded. A colony in such a condition will never perform the wonders in gathering honey that we expect from one less populous. Such a colony feels instinctively that its abode will soon be too small, and the swarming fever sets in; and we know that when this is awakened, the bees will continue to loaf. At the most, only as much honey will be gathered as is needed for making the swarming preparations. A colony with the swarming fever is of little value as a honey-gatherer.—GRAVENHORST.]

It is rarely that one finds so much in so few words as is expressed in the above quotation. The thought comes in here, that there is a condition involved that is hard for the average beekeeper to comprehend—that is, if a colony of bees comes to its best or full working strength just two or three days before the honey-flow is on, that swarm is very likely not to store more than one-half as much surplus as one that comes to maturity just with the flow. This, of course, is with the supposition that neither one should cast a swarm.

The other, or medium-sized colony, may not have wintered quite as well as the other, but had a good queen that kept what workers there were in the colony just hustling to take care of what eggs she supplied, coupled with all the other work of the hive, so that there was not a single minute but that every bee in the hive had all it could do, and many times more. Such a colony is ready for the harvest when the season does open up.

Let us look inside of the other hive—the one that was ready before the harvest was on. They have come to maturity a few days too early for the season. Although they may not have any

queen-cells started during this time, if you look down between the combs you will find little clusters of bees hanging together; and if the weather is warm, perhaps some may be seen crowding out at the entrance. These bees that have clustered in this hive have learned the art of shirking, and there is nothing to do but let them swarm, because that alone will bring back that energy and hustle they had before coming to this stage of stagnation that I have explained above.

The case cited above is, perhaps, an extreme one, but I assure you that bees do not have to come to this stage of development to be worth only half a colony from a surplus-honey view-point.

Some take brood from the strong to build up the weak, doing this previous to the honey-flow, with the express purpose of preventing this stagnation on the part of the strong, and at the same time building up the weak. Such procedure, if practiced in an intelligent manner, so that the weak and the strong shall be equalized, will produce good results, because none will be too strong too soon. When this is properly done they will all work with the energy of a newly hived swarm; then if there are still left more weak colonies than can be built up into colonies in time to take advantage of the honey-flow, such colonies can be allowed to build up into colonies of their own will, or they can be used in an almost unlimited number of ways at the option of the apiarist.

The shifting of brood by the experienced, for any reason whatever, should be done on a small scale, and for experimental purposes only.

Since I have been in the business more extensively, a different system of management has been found necessary; namely, a scheme for using double-story ten-frame hives. A system that is all right, and which works well with one home yard of bees, may not work at all with an outyard or with extensive beekeeping where more bees are kept than the apiarist himself can care for, necessitating the work being done by others, and these, many times, perhaps of small experience.

It is a fact that a very large hive containing an amount of honey in excess of that needed to carry the colony through spring, with an abundance of comb room, will not swarm nor acquire the swarming fever, until the honey season is on, when the bees, assisted by the queen, get the hive nearly full of brood and honey.

A ten-frame Langstroth hive, two stories high, is ample in size to hold back the swarming fever until the white-honey season is on in June. Colonies in such a hive, that are good to strong, during the period of warm weather previous to the honey-flow,

usually commence to store honey in this location about May 20. With so much clustering room, such as these hives afford, no swarming fever will be induced.

When the warm weather of the last part of May arrives, an upper story is given our medium to strong colonies, either with or without a queen-excluder, depending on whether it is a yard where excluders are used or not. Our honey season usually commences during the second or third week of June, in this location. As there is no honey-flow previous to the main clover flow in June, sufficient to cause bees to contract the swarming fever, the ten-frame hive used two-story during practically all of the hot weather previous to the honey-flow, keeps our bees practically free from the swarming fever, and without handling a single brood-comb.

This system is well adapted to the eight-frame hive or smaller hives, only the second story should be of worker comb, and the queen allowed full sway through both stories. Later on, after the bees get to work in dead earnst, if one likes, the queen can be put down into the lower story, and an excluder placed on the lower story, since the bees have now almost forgotten there is such a thing as swarming, being so intent on the securing of the abundance of honey that ought to be coming at this time. Moreover, with the Italian bee this is the season of the year, or the season has now shaped itself so that one eight-frame story is all (and usually more than) the queen will occupy with the brood, because the bees are so intent on storing honey.

This same principle of giving abundance of comb room during hot weather, previous to the main honey-flow, with the idea of preventing the bees from thinking about swarming, is carried out with our comb-honey as well as with our extracting colonies.

In the case of the comb-honey bees, any empty brood-nests are used for the purpose of this extra room. Then we have provided about half as many sets of shallow extracting-combs as we have colonies of bees in the yard, which are used to finish up the season in the production of comb honey, and also to give clustering room previous to the season, as I have explained above.

CHAPTER VII

How to Take Care of Swarms

SOME TIMELY HINTS ON MANAGEMENT DURING THE OPENING OF THE SURPLUS-HONEY SEASON

It is time to put on the supers (the parts of the hive that contain the surplus honey) by the time the first clover-bloom is seen. Five days later, on opening the hives we may find that the bees have done nothing in the sections, and we wonder whether they will ever start. In three more days we possibly find that they have still done no work in the sections, so a super is lifted off and a comb of brood lifted out. If we do this we perhaps find that the bees are beginning to draw out the cells near the brood, and that they are placing new honey in these elongated cells. A beginner, on seeing these, might think that the bees were going to fill the brood-combs before working in the sections; but in two more days we shall probably find that they have begun storing in the bait-section. This bait-section is one carried over from the previous season, placed in the center of the super to get the bees to work in the sections. The new sections look nice and clean beside this old dirty one; and no one would think of using such an old piece of comb were it not for the fact that the bees without such bait are too slow to enter the supers.

It is several years since I used bait-sections in my comb-honey supers. Instead of these I use an extracting-comb in place of each outside row of sections. These extracting-combs are much superior to the bait-sections, for there is not usually enough of these left-over sections to provide as much of a bait as these two extracting-combs supply. The main reason for putting extracting-combs at the outside is to start the bees working on that part of the super that is usually finished last; namely, the outsides and the corners. In this way the whole super is finished nearly at once, and the experienced beekeeper knows that this means comb honey of superior quality. The editor says there is a growing

demand for comb-honey supers equipped with some extracting-combs, and I have never known of a case where this plan was tried and abandoned. It prevents much of the swarming so prevalent in comb-honey production, and this means, of course, much more surplus honey. I have managed a yard of about one hundred colonies for the last two years, and by following this plan I have had less than twenty per cent of swarms.

The second reason for placing extracting-combs, which are to act as the bait-combs, at the sides of the super is that the queen rarely goes to the outside combs to lay eggs; and this means that these extracting-combs can be kept white and clean so they will not darken the cappings of the sections next to them. I use separators between all of the sections, and also between the extracting-combs and the sections nearest them.

HANDLING SWARMS

The beginner is likely to have so many swarms, due to the usual method of working for comb honey and to his inexperience, that but little surplus honey will be secured. Generally speaking, the more swarms there are, the smaller the surplus-honey crop will be.

The first step in preventing swarms is to put the supers on a week or so before the honey-flow opens, as mentioned before—not because the bees actually need the extra room, but to keep them from becoming crowded so that they get the swarming fever.

The next step is to give more super room before the first supers are full. An empty super ought to be given when the first one is not more than half full. This second super can be set on top, or the first one may be lifted up and the empty one placed next the hive. We set the empty supers on top of the ones given at first; and when the bees get nicely at work in them we change places and put the second super under the first one. This means a little more work, but, in return, rather better-filled sections are secured.

The beginner is usually anxious to have all the natural swarms possible in order to increase the size of his apiary. A neighbor of mine, who was too busy a farmer to take care of bees, once had a dozen colonies at the beginning of the season, and before he knew what was happening a swarm issued from first one colony and then another. The result was that his bees swarmed so much that practically no surplus honey was secured. He hived every swarm, good or bad; and, since the season was only an ordinary one, some of the later swarms starved before the next spring. Finally, when the

honey-flow began the following year there were only about as many colonies as there were the year before, and the amount of honey secured was very small besides. It is better to make haste slowly, when increasing an apiary; for a live colony in the spring is worth many dead ones.

The plan that I shall here outline will enable the beginner to get a fair crop of surplus honey in connection with a pretty good increase besides. After the clover honey has been coming in for a few days, some of the colonies will cast swarms. No after-swarms should be tolerated, so when the prime swarm (that is, the first swarm) is in the air, the hive which it came from should be carried to a new location at least 30 feet from the old stand. However, if it is desirable to set this old hive near where it stood before, it should be carried away just the same, and then, at night, after the new swarm is hived, the old hive can be moved near this new swarm if desired. If this old hive had been placed only a few feet from where it formerly stood, many of the bees would have found it and would have gone back to it again, strengthening the parent colony enough, possibly, to cause an after-swarm. It is desirable to have all the flying bees with the new swarm, for it will do practically all the work for the next few weeks, there being no working force left in the old hive.

As soon as the swarm in the air begins to cluster, a new hive should be set on the old stand, and the sections from the old hive put on it whether they are partly filled or not. It is not necessary shaking them in front of the new hive; for, even if a few are left, to wait until all of the bees have clustered before getting them and they would have no place to go to but back to the old location, on which, in this case, the new hive stands. Now, if the supers are given at the proper time, etc., the bees of this swarm should not swarm again during the honey-flow.

HOW TO GET SWARMS THAT ARE CLUSTERED IN INACCESSIBLE PLACES

If a swarm clusters on a small limb of a tree where it can be shaken into a Manum swarm-catcher and carried to the hive, almost any one, even without experience, can get along very well; but if it clusters on the trunk of a tree, on a fence-post, or on the ground, it is rather difficult for one to get it who does not know how. We will suppose that the cluster has formed on a fence-post. Set the Manum swarm-catcher near the post (a couple of feet higher is all the better), and then with a long-handled tin dipper dip most of the bees from the post, and empty them into the swarm-

catcher. Now smoke the rest of the bees off the post and they will soon alight on the basket. In this way the whole swarm can be carried to the hive and run in.

HOW TO GET A SWARM INTO A HIVE

The whole cluster of bees in the swarm-catcher should not be dumped in front of the hive at once, for a large number of them will take wing. About a quart of bees should be dislodged from the catcher and shaken near the entrance of the hive; and when these bees set up that " homing hum " every bee in the catcher will hear it, so that, when they are dumped in front of the hive, instead of many of them taking wing, some of them, perhaps, going back to the original clustering-place, all will stay on the alighting-board, and everything will be quiet. It is quite important to have the bees enter the hive as soon and as quietly as possible; for if another swarm should issue soon after the first one is hived, the bees of this second swarm would be attracted to the first, and would be likely to enter with the rest.

It often happens that another swarm issues about the time that the first one is nicely clustered on the swarm-catcher; and in this case, if the first swarm be hived immediately, the bees of the swarm in the air would unite with it, so that there would be the two swarms in one hive. While this would do no serious harm, I usually prefer to have each swarm hived by itself; for by so doing about as much honey is secured, and I have the extra colony besides. In such a case, therefore, the proper way would be to carry the first swarm, already on the swarm-catcher, into a cellar, or set it aside in the shade, with a sheet over it, so the bees of the swarm in the air will not find it. While this is being done it is quite likely that the other swarm will cluster in the place just vacated by the first swarm. It may then be shaken into a second swarm-catcher and hived in the usual way; and when everything in the yard is quiet the first swarm left covered with a sheet can be hived as usual.

WHAT TO DO WHEN MORE THAN ONE SWARM COMES OUT AT A TIME

It sometimes happens that two or more swarms emerge at about the same time, and there is no way of keeping them from going together. This is a more serious matter, and the beginner will hardly know which way to turn. He will very likely get all the bees into one hive, as this is apparently the easiest way out of the difficulty. We will suppose that two swarms have issued and

clustered together. The hives containing the parent colonies should be removed just as in the case of a single swarm, and empty hives put on the old stands. Partly filled supers from the old hives should be put on the new hives, and entrance-guards fastened over the entrances. It is best to do this at once, for the bees of the newly hived swarm should not be disturbed for three or four days, or else they may decide that their new quarters are not just right, and that they had better leave. When nearly all the bees of the two swarms have clustered, about half of them should be shaken into the swarm-catcher and taken to one of the new hives. A queen-cage should be provided, for one of the queens will have to be found and caged temporarily. Before shaking, a wide board should be leaned up against the front of the hive for an alighting-board. As before, a few of the bees should now be emptied on this board; and, since there is a queen-excluding guard over the entrance, only the workers can get in. As soon as the few bees set up the " call " the rest should be dumped on the board, a little further from the hive than before, in order to give more of a chance for finding the queens as they run up. When this first lot of bees is run in, whether the queen is found or not, the other portion of the swarm should be secured and dumped in front of the other hive similarly arranged. During this process, usually both queens are found, and I have never failed to find at least one of them. If both are found, one is run into each hive, and then the amount of bees equalized (if not already so), and everything will be well. If only one queen is found, she should be caged and kept in the shade where nothing can harm her, and the entrance-guards removed. In fifteen or twenty minutes the bees of the queenless colony will make a demonstration, and, if left long enough without their queen, will come out and mix with bees of the adjoining hives. Before this can take place the caged queen should be allowed to run in as soon as possible. A welcome hum will greet her as she enters.

The clipped-queen plan for handling swarms is too complicated for a beginner, no matter how good it looks on paper.

CHAPTER VIII

Management Previous to the Honey-flow to Prevent Swarms

INCREASING THE AMOUNT OF BROOD PRODUCED JUST BEFORE AND DURING THE WHITE-HONEY FLOW

THE CHAPMAN PLAN

For preventing swarming and for increasing the amount of brood produced previous to and during the fore part of the white-honey flow, Mr. S. D. Chapman, of Mancelona, Michigan, has a system of his own. He uses eight-frame hives, and the system is about as follows: At the approach of the warm period, which is usually near May 20, in this locality, he shakes the bees from two frames of brood, placing these two brood-frames without the bees in an upper story, taking out two empty combs from the upper story to replace those just removed from the lower story. He now puts a queen-excluder on the first story and the second story over it. This gives the queen in the lower story two extra combs to use for breeding purposes; and if there is young brood in the two combs placed in the upper story, this extra space in the two combs amounts to considerable. In a week or two, two more frames of brood are lifted up into another or third upper story, making a three-story hive. This method of lifting brood from the brood-nest into upper stories is continued until it is desirable to curtail brood production on account of the bees not maturing in time to be honey-gatherers.

During 1906 Mr. Chapman lifted brood according to this plan in three-fourths of an outyard, when it turned cold and a strong northwest wind came up. On the colonies in the remaining fourth of the yard he put on the upper stories, but placed in them no brood. These last colonies were as good as the average of the yard. Shortly after the beginning of the raspberry flow he found that those colonies in the three-fourths of the yard, where brood had been placed in the upper stories, had from fifteen to twenty pounds of honey to their credit, and this gain remained throughout the season.

By following this plan, whole yards of bees have been worked for extracted honey through the whole season, without a single swarm issuing. It can be seen that powerful colonies need more room during the period just before and during the fore part of the white-honey flow than is provided in the ordinary hive in use today, and the above plan shows at least one method that may be employed with regular hives to provide this extra room at a time when it is necessary. Of course, when this time is past, the hive is brought back again to its normal size.

In the fall of the year 1906, during the early part of the buckwheat flow, our Pine Lake yard of 100 colonies was left without upper stories until the hives were crammed full of this early buckwheat honey for winter stores. At this time some of the most advanced colonies built comb and stored honey on the outside of the hives, and some of them must have had as much as 35 pounds of honey in the hive when they went into winter quarters. This was more honey then we were in the habit of leaving, and was even more than a ten-frame hive could hold and still leave room for the colony to breed up in the spring. The consequences were that, when the upper stories were given in May, 1907, before the honey season opened, these bees in the Pine Lake yard carried a few pounds of this buckwheat honey in the brood-nest into the upper story to make room for the queen below, with the result that, when the honey was extracted, it was amber in color and had to be sold for one cent a pound less than the rest, which contained no dark honey. This is the only case of the kind that has come to my notice, and even this would not have happened under normal circumstances.

When I first began to produce extracted honey the plan then in vogue was to lift a frame of brood into the upper story to start the bees to work there immediately. While this was successful so far as getting the bees to work in the supers was concerned, yet it was a noticeable fact that the honey produced by this plan was never quite as good in color as when no brood was lifted above. I soon learned that it is not necessary to lift brood above to get the bees to working in the supers, drawn combs being found sufficient. Now, in lifting this frame of brood into the upper story there was always more or less honey from the previous season lifted with it, which honey was often gathered from buckwheat. This brought about the same result as that outlined above, and the off grade of honey being not to my liking the system was abandoned. This is the worst feature about the Chapman system, for the old honey that is likely to be lifted up with the brood causes all

the honey to be of a somewhat darker color and perhaps of a poorer quality.

THE COVEYOU PLAN

Mr. E. E. Coveyou, of Petoskey, Michigan, has a very good plan for handling his bees during the fore part of the honey-flow. He uses ten-frame hives, and before the honey-flow he gives the colonies another story of combs without putting an excluder between. The cells of these combs should be of the worker size, for the queen is allowed full sway through this story until the colony needs a first one. At the time this third story is given, the queen is placed below in the first story, a queen-excluder is put on, and then the third story of empty combs put over it. Finally, on top of all, the second story partly full of honey and brood is added. This plan has the advantage of giving the colony an abundance of comb room and also an unlimited amount of breeding-space for the queen during the critical swarming period previous to the honey-flow. This is one of the best systems I have heard of to be used for this purpose in connection with the queen-excluder, for, aside from the advantage gained by allowing the queen unlimited breeding-room during the early part of the season, all of the advantages of the excluder are secured in extracting-time, for the brood lifted above with the second story will all be hatched and the combs filled with honey long before extracting-time, for Mr. Coveyou does not extract until late in August—perhaps 30 days after the close of the raspberry flow.

Before putting on any upper stories Mr. Coveyou clips his queens, for he works three yards practically alone with the exception of extra help made use of at extracting-time, or when some extra work is to be done. By having his queens clipped, and by being with the bees every day during the swarming or honey season, he can hive any swarms that may issue. It is obvious that, if the queens had not been clipped, the swarms would have gone to the woods and been lost. If a swarm should issue when he is working at some other yard, and returns to the hive, he is very likely to reach this yard by the next day; and when they come out again, as they almost assuredly will, he can hive them.

PUTTING ON EXTRA SUPERS

Knowing by experience that bees will enter upper stories without any hesitancy when placed on top of the hive or on top of any story that may be already on the hive, and as our extracting is not done until after the white-honey season is over, we have no

lifting of full stories except at extracting-time. We put on the third story, when the second one is about two-thirds full, or at least before all the empty comb-room is used. However, no set rule can be given as to the proper time for putting on extra supers, as there is a difference in the colonies in this respect. Some bees will work in a few combs and begin to cap those started first, while those combs at the outside of the super will not be in use at all. In such a case it would be folly to put on another super as long as this condition continues. Other colonies will fill every available cell with honey before commencing to draw out the combs or to cap the cells. Such a colony will need more extra comb-room than the one first mentioned, for in the first case the bees seem to be more adapted to working wax and drawing out combs. It is well to humor these dispositions, and not compel the bees mentioned in the last case to draw out the combs to the full capacity of the space allowed. They should, instead, be given additional comb-room as they are able to use it, and they will store much more honey than if compelled against their will to draw out cells to the full depth at once.

At extracting-time, if one wishes to make two grades of his extracted honey all of the partly filled and unsealed combs will be in the top stories if the plan just outlined is followed, and these can then be taken off and extracted by themselves. I believe this to be the ideal way, for the first-given supers are filled out more fully and capped more evenly than if they were lifted up and the empty one placed beneath them next to the brood-chamber. Then with this latter plan of lifting the full supers up and putting the empty supers next to the hive one is likely to give additional room faster than the bees really need it, with the result that the honey is capped over when the combs are thin, and even when some of the outside combs may not be entirely finished.

Putting empty stories on top is probably the only practical way to manage when a queen-excluder is not used between the hive and the supers. If the extra supers are added intelligently when the season is near the end, by giving the colony only what storage room it will need, the queen will thus be crowded down into the hive below, leaving the supers nearly free from brood. In order to follow this method one should bear in mind that it is part of the system, in that the amount of brood in the upper story is to be curtailed toward the close of the season, as explained, and then the honey left on the hive a week or two after the close of the season, to allow it to cure thoroughly. Incidentally, the brood that

may be left in the upper stories has thus hatched out before extracting.

The old orthodox plan of placing the empty super above the queen-excluder and under the partly filled one is still practiced by the majority of Michigan beekeepers; and when the first one is about two-thirds full it is lifted up and an empty one placed beneath. This plan is continued clear through the season, the advantage claimed for this system of extra work being that, by lifting up the full stories and placing the empty ones next to the brood-chamber, the bees are stimulated to greater activity by this dividing of the hive when placing the empty combs next to the brood-chamber. Now, while I admit that it may be advisable to put an empty comb-honey super next to the brood-chamber, after a long experience I fail to see where the advantage is in the production of extracted honey, and where there is any gain in lifting up heavy upper stories during the honey season, especially when the extracting is all done at one time.

THE USE OF AN EXCLUDER TO PREVENT BROOD IN THE SUPERS, AND HOW BY THEM A WHITER HONEY IS SECURED

Before leaving this subject I would say that, if one does much extracting during the honey-flow, or in the case of a beginner who has had but little experience, I would advise the use of an excluder, for there must be no unsealed brood in the extracting-combs or the honey obtained will not be of good quality. The very sight of these young grubs floating on top of the honey would be enough to condemn the plan of trying to manage without an excluder. If a visitor should happen to come in, those grubs would, of course, be called worms, and it would not help the sale if it should get out that the honey is " wormy." Then there is the food provided for the larvæ, some of which is thrown out with the honey, and this surely makes the honey of a poorer quality. My advice, therefore, is to use an excluder under such circumstances until you learn a better way.

CHAPTER IX

The Honey-flow

THE VALUE OF KNOWING THE LOCAL CONDITIONS; PUTTING ON AND TAKING OFF SUPERS; FULL SHEETS OF EXTRA THIN FOUNDATION RECOMMENDED FOR SECTIONS

There are some beekeepers who do not seem to know that there is a period during which the great share of the surplus honey is gathered. In the Northern States there may be two such periods; but most of the locations in those States have only one main flow, and this from white clover, although in some places this is followed by a basswood flow. The period of white honey varies from a very short flow in a poor year to one extending over as much as six weeks in an extra good year.

The time of the commencement and ending of the season is also a little uncertain. In some seasons clover begins to bloom the first of June, and produces honey a week or ten days later; then in other seasons it does not produce honey before the 20th of June. We figure that a late season means a short one, and our guess has usually been about right, along these lines.

The basswood is even more uncertain as to the time of bloom and duration of the honey-flow. It blossoms with us as early as the 1st of July in some years, and as late as the 10th in others; but an average date is from the 4th to the 7th. About this time clover is through yielding; and so, usually, the basswood laps on and makes a continuous flow of white honey until the season closes, which is rarely later than July 15. Where there is no basswood the flow from clover usually ends about July 8, and the novice can figure on his crop of white comb honey being ready to remove from the hives about the middle of July.

These calculations are based on the supposition that there is to be an ordinary flow of honey. Of course, there are seasons of failure and seasons like the last, where only half a crop was harvested; and, once in a while, an extra good season when the flow may be somewhat longer than usual.

It is of vital importance to know the location well, so as to be able to tell very nearly when to expect he main surplus flow to begin and to close, for in no other way can comb honey be produced intelligently. If the beginner does not know his location it would be well to visit and " pump " some old " vet " in the business.

PUTTING ON THE SUPERS

A very good rule is to put on the sections when the first bees are seen on clover; then when they have worked three, or, perhaps, four weeks they can not be expected to work much more. In a basswood location, if the trees should appear full of blossoms, and the weather is suitable for the bees to gather honey, the honey-flow may be lengthened out a few days. With favorable conditions basswood is the freest yielder we have in Michigan; but since it happens that these conditions are rarely right we do not put much dependence on basswood, especially as it is being cut so fast for lumber.

I use, and advise that beginners use, full sheets of extra thin foundation in the sections, and I think that these sections should be built between separators. To do this it is absolutely necessary to know the location in order to tell when the main flow begins, and thus get the sections on at this time.

When the season is over—that is, a week after the flow stops —and the bees are through capping their white honey, every super should be removed from the hive, no matter whether full or not. If there is a fall flow, the supers should be put on again when this commences, but not before. Many leave their partly filled supers (left over from the white honey-flow) on the hive during the dearth of honey between the white-honey flow and the buckwheat flow. During this time the bees tear out a great share of the unused foundation in the sections. This is the worst time of the year for the bees to propolize, and this and the mutilated foundation leave the sections in anything but a desirable condition for the buckwheat flow.

TAKING OFF SUPERS

This is the kind of honey we have to compete against when we ship our honey to market. If only the people who produce this stuff were hurt there would be less reason to complain; but every one who produces honey for sale is affected; one has only to look at the honey quotations to see how things are going, for the quotations usually read, " Market overstocked with low-grade honey."

I have told you heretofore that bees would bring up honey from below, and cap and finish sections for a week after the honey has ceased coming in from the field. Taking advantage of this fact we leave our comb honey on the hive until the end of this period. If this is the end of the first (or white) honey-flow, escape-boards are put in under every super in the yard; and when free from bees the supers are removed to the honey-house, and sorted. Those that are fit for the market are cased up, and the rest either " fed back " to be finished or the honey extracted. In the latter case these partly filled sections can be used for baits for the fall flow if there is a fall flow; if not, they are stored away until the next season, when they are used.

I hate to be compelled to record the fact that three-fourths of the comb-honey producers practice the slovenly way of leaving their comb-honey supers on the hive clear through the season—that is, those partly filled supers at the end of the white-honey flow are left on the hive to be finished up with buckwheat honey. This makes a bad mess. The white-honey part of the section will be travel-stained, and covered with propolis. Then sections containing two kinds of honey are never satisfactory. This practice is especially undesirable when there is an interval of three or four weeks between flows, as with the light and dark honey-flow in the Northern States.

It is necessary that the comb-honey producer should have an extractor. It need not be so elaborate an affair as the extracted-honey producer would require; but, nevertheless, good comb honey can not be produced without one. Each kind of honey should be produced by itself as much as possible. The bees should never be allowed to commence a certain honey-flow unless all the honey of a previous flow has been extracted from the sections so they can commence anew and do good work. It is impossible for the bees to fix over an old job and make a satisfactory new one.

If this class of beekeepers would only eat all the dirty honey they produce there would be no particular occasion for writing on this subject, for then they would hurt no one's business but their own; but this is not the case, for no one can deny that such honey finds its way on the market.

EXTRACTING-TOOLS; HOW TO PREVENT ROBBING WHEN THE EXTRACTING IS DONE DURING A HONEY-DEARTH

The tools for the yard work in harvesting a crop of extracted honey consist of a Daisy wheelbarrow, two empty hive-bodies, two Coggshall bee-brushes, one of the latest four-inch smokers, and

three robber-cloths. The last named are nothing more nor less than cloths two or three inches larger than the top of a hive with sticks nailed on each long side. One of these cloths is laid over the hive after the cover is removed, to keep out the robbers; and as it is quickly rolled up far enough to take out a frame, and then rolled back, the whole top of the hive is never exposed at one time. The cleats for the two long sides of the cloth are made of pieces of lath 20 inches long. One edge of the cloth is wrapped entirely around one of the pieces, when a second one is laid on top of the wrapped lath, and nailed. The cloth now comes out between the two pieces of lath, and is thus firmly secured. Two more pieces are nailed on the other side of the cloth, which makes it complete. The sticks must, of course, be on the long side of the cloth rather than on the ends, so that they will be parallel with the top-bars. In this way it is very easy to roll the cloth back just far enough to lift out a frame.

In removing the honey from the hives the row furthest from the extracting-house should be begun on first, so that it will not be necessary to work at any time in front of the disturbed colonies; for if the work is done when there is no honey coming in from the field, robbers are always troublesome. Place the wheelbarrow back of the hive and put one of the empty hive-bodies on it lengthwise so the frames may hang parallel with the barrow to prevent unnecessary swinging and shaking. The other hive-body should be placed at one side of the colony, leaving a space between for the operator. When the hive is to be opened, the smoker should be working well; and as soon as the cover is removed the bees should be given a gentle puff of smoke. If too much is given, bees become demoralized, some flying out and others running across the combs, so that the results are not at all satisfactory. There should be no smoke blown down between the combs, therefore, until most of the bees have run off the top-bars of the frames, and started down toward the lower part. When bees are once started properly, there is no trouble in keeping them going, especially if the honey is all capped (as it should be), for the idea is to keep the bees ahead of the smoke as much as possible. When about three-fourths or more of the bees are smoked out of the upper story this should be quickly lifted off and set on the empty body that has been placed near by for the purpose. It is important to be quick about this, so that none of the bees may have time to run back. If there are more stories to be taken off, repeat the whole operation, setting additional stories on top of the one first removed. When the first story is taken off, quickly cover one of the

hives with one of the robber-cloths, as the bees will soon "boil over," when there will be trouble in putting on the cover without killing the bees. Having the bees nearly all smoked out, a comb should be lifted with both hands and then held over the entrance of the hive. In that position it may be held with the left hand in the original position while the right hand holds the brush. A slight turn of the wrist exposes either one side of the comb or the other to the brush. . . . . Two sweeps of the brush on either side of the comb are usually sufficient to remove the bees with the exception of a few stragglers next to the bottom-bar, which are allowed to pass out through the bee-escape on the honey-house windows later. As fast as the combs are brushed they are put into the hive-body on a wheelbarrow. If the first three combs are placed at the furthest side of the bodies, the further edge of the robber-cloth can be lifted up to get them in; but it is best to put the five other combs in from the front by lifting the front edge of the cloth. As a full upper story will yield about 50 lbs. of extracted honey, we wheel in only two at a load.

One great secret of success in extracting when there is no honey coming in from the field is to keep all honey away from the bees while it is being handled in the yard. Another secret is to avoid giving combs wet with honey back to the bees while the extracting is going on.

If it is desirable to return these combs to the bees for any purpose, they should be given just at night, when they will all be cleaned up by morning so that there will be no commotion.

The honey should be extracted almost immediately, so that it will not have time to get cold. In order to work to the best advantage there should be two operators in the extracting-house, and one to take off the honey and wheel it in. All honey to be extracted should be piled up near the uncapping-tank. While one person does the uncapping, the other turns the extractor and handles the honey, although sometimes the uncapper has time to help a little in some other work.

When uncapping, the end-bar of the comb should be rested on the pivot or point in the cross-piece of the uncapping-tank. It is best to use a long uncapping-knife, commencing at the lower end of the comb, and cutting deep—down even with the wood—with a drawing motion. As the knife reaches the middle of the frame it will be necessary to hold the comb nearly vertical to prevent the cappings from falling back on the comb instead of directly into the capping-box below from the outer edge of the knife. If the

work is done well, the cappings, many times, fall down in one whole sheet.

While it does not take any great skill to operate the extractor one should be careful, especially when the combs vary greatly in weight, to put them into the baskets in such a way that the reel will be as nearly balanced as possible. Where there are several combs to select from, one can usually pick out the ones that will balance the best, and, after the first two or three turns, the weight will be so equalized that the reel will run almost as evenly as if the combs were of the same weight in the first place.

HOW TO TAKE CARE OF THE HONEY AS IT RUNS FROM THE EXTRACTOR; HOW TO PREVENT IT FROM RUNNING OVER ON THE FLOOR

For our honey-house in Charlevoix County, a frame dwelling-house 18 x 26 feet was bought. The partitions were removed and the ceiling raised until the room was about 9 feet high. The windows were removed on both sides, and 6-ft. shop windows substituted and covered with wire screen on the outside. Board shutters for each window were made to fit on the inside to keep out the storm. The whole interior of the building was covered with tarred paper to prevent robber bees from getting in.

At one end of the building toward the bee-yard, a 3-ft. door was placed a little to one side of the middle of the end-wall. At one side of the door at the front of the building a space of flooring 4 x 7 ft. was removed, and the soil dug out to the desired depth. We used this pit for handling the honey in a manner similar to that described by Mr. Hanson, only our honey ran from the extractor into a strainer-tank with a gate near the bottom. From this gate it ran into 60-pound cans, which cans, one by one, were set on a Coveyou automatic scale that weighed the honey, shut off the gate when the can was full, and rang an electric bell until some one removed the full can and put an empty one in its place.

I bought a yard of bees 25 years ago, which was fitted up for extracted-honey production. Before this I had always run for comb honey; and when I bought this yard I worked the colonies in the same way that they had been worked before for extracted honey by another party. During extracting, the honey was run from the extractor into tin sap-buckets and allowed to stand over night. In the morning it was skimmed with a large spoon, and then emptied into a 600-pound tank which had a gate near the bottom. There were two of these tanks. The following morning the honey in the tank was skimmed and drawn out into 60-pound

cans. The buckets were used one season, but at the end of this time we concluded that the honey had been handled more than necessary. For a good many years after that we emptied the honey from the pails directly into the large tank and allowed it to stand over night, then skimmed it and ran it into cans. This saved one handling, and we found the honey was equal in every respect to that which had been handled twice by means of the sap-buckets.

Since that time our honey has been handled as previously explained, but put into the cans as fast as extracted. This does away with a good deal of the labor. I admit that pails for handling the honey from the extractor are not very satisfactory; but I presume that four-fifths of the extracted honey is still handled in that way. Allow the extractor to fill with honey until the revolving baskets begin to swim in the honey. Then set the pail under the gate, lift the handle of the gate and hold it up until the pail is full. With the large gates now put on extractors, and with warm honey a pail will fill in about one-fourth of a minute. Now empty the pail into the tank, leaving it turned upside down to drain until the extractor needs emptying again. We have been all through the troubles which follow when the extractor is run with the gate open all the time. It is a poor and expensive way simply to close the gate when a full pail is exchanged for an empty one. The other way is much better.

THE TOWNSEND UNCAPPING-BOX; THE ARRANGEMENT OF THE FURNITURE IN THE HONEY-HOUSE

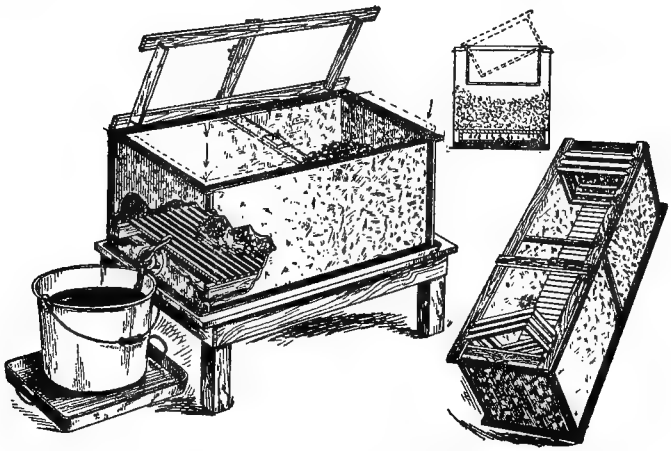
At our honey-houses at the extracting-yards we have a four-frame automatic extractor, a Townsend uncapping-box, a honey-tank provided with a strainer and a gate at the bottom, and platform scales with an electric bell attached to give warning when a can is full. Since we put in cans all of our honey as fast as it is extracted, we have on hand also a stock of 60-pound cans. Minor tools are necessary, such as uncapping-knives, pails, wash-dishes, towels, etc.

Our extractors are the automatic four-frame machines, none older than the 1907 model. We disposed of all our small extractors, and also of the old four-frame Cowan machines, for we wished to have nothing but the most up-to-date tools to work with.

Our Townsend uncapping-box is made of galvanized steel, and is 4 ft. long, 2 ft. high, 2 ft. wide, as shown in the engraving, p. 54. The slatted framework at the bottom is made smaller than the can so that it may be easily removed to be washed. As there is only a 1½-inch space under this frame for honey storage, we

leave the gate open all the time so that nearly all of the room in the tank is available for the storage of cappings, as it should be.

The engraving does not show the frame at the top correctly, for the long side-pieces should be close enough together so that the frames can hang between them as though they were in the hives. After the honey is extracted, the combs may be placed back in this rack; but the principal value of the arrangement consists in providing a place where the uncapped combs may be hung to drip before they are extracted, for in this way no extra apparatus is needed.



The Townsend Uncapping Box

The two short pieces of the framework at the top should be nailed on the bottom of the long side-pieces about 1¼ inches from either side. It can be seen that, when the long side-pieces rest on top of the tank, the short cross-pieces fit just inside, keeping the framework from sliding either way, and yet allowing it to be easily removed when the cappings are taken out. The metal pieces containing nail-points can be tacked on in any position to suit the convenience of the operator.

We have used many different designs of uncapping-boxes, but none seem to me quite so convenient as this Townsend box. It will hold all of the cappings from one extracting in a yard of ordinary size. We use a six-tined short-handled fork for handling the cappings, and each morning the dry cappings from the day before are pitched up toward one end of the tank, and in this way the honey from the new cappings does not have to drain through the dry ones over and over again as it would if we were to uncap on top of the

cappings left from the day before. In one instance we had more cappings than we could keep in the tank, and a sugar-barrel with a perforated bottom was set over a galvanized steel washtub, and the dry cappings pitched into it. In this way the capacity of the tank may be said to be unlimited. The advantage of the large area of the bottom is that the honey drains out of the cappings much better if they are spread out in a thin layer than it could in a deep tank where the bottom is comparatively small.

The cost of the tank alone is about $4.00, the freight making it perhaps $5.00. We use the Perfection 1½-inch gate, which costs 75 cts. If the woodwork should cost $2.00, the entire expense of the tank complete would be about $7.75, and we think we have a much better and cheaper arrangement than a wooden box.

The honey as it comes from the extractor is drawn off into a 14-quart pail. We never make the mistake of leaving the extractor-gate open all of the time, for it is too easy to forget and allow the pail to run over, making a big mess on the floor. In order to avoid this waste of honey we at one time went to the expense of having shallow pans made to catch the overflow in case we forgot. We now allow the pail to remain inverted over the strainer until the reel of the extractor begins to " swim " in the honey in the bottom of the extractor. We then draw off a pail of honey without letting go of the gate; for when the honey is warm it does not take one-fourth of a minute to fill the pail through the large gate, and there is no risk of running the pail over. There is also the advantage that the pail may be draining during the time when another pailful is being extracted.

The strainer tank is of galvanized steel, and holds 15 or 20 gallons of honey. A heavy wire selvage is put around the top to stiffen it; and as this wire is on the outside it is easy to fasten on the cheese-cloth strainer, which is held in place with a small rope drawn tight by being twisted with a stick. This cloth strainer must, of course, be fastened very firmly or it will go down into the can when a pail of honey is emptied on to it. At the bottom of the strainer-tank is a 1½-inch Perfection gate through which the honey always runs in a round stream which is just right for filling the 60-pound screw-cap cans. Most of the other gates throw the stream to one side during the time they are being opened or closed, and some of the honey is, therefore, daubed over the side of the can. All this is avoided by using the Perfection gate, which throws a round stream, no matter how wide it is opened.

The strainer-can is elevated in order to run the honey from the gate into a 60-pound can set on the scales. The gate is open

all the time except when the cans are changed. An electrica alarm, as first described by Mr. Hutchinson, is used to give u warning when the can is full—see Fig. 2. No one should hesitat about trying one of these alarms, for they are very simple. Th engraving shows the method of connecting the bell to the battery In brief, two wires run from the two posts on the battery to th two posts on the bell; but one wire is broken, one of the ends being fastened to the scale-beam at the pivot, and the other being locate

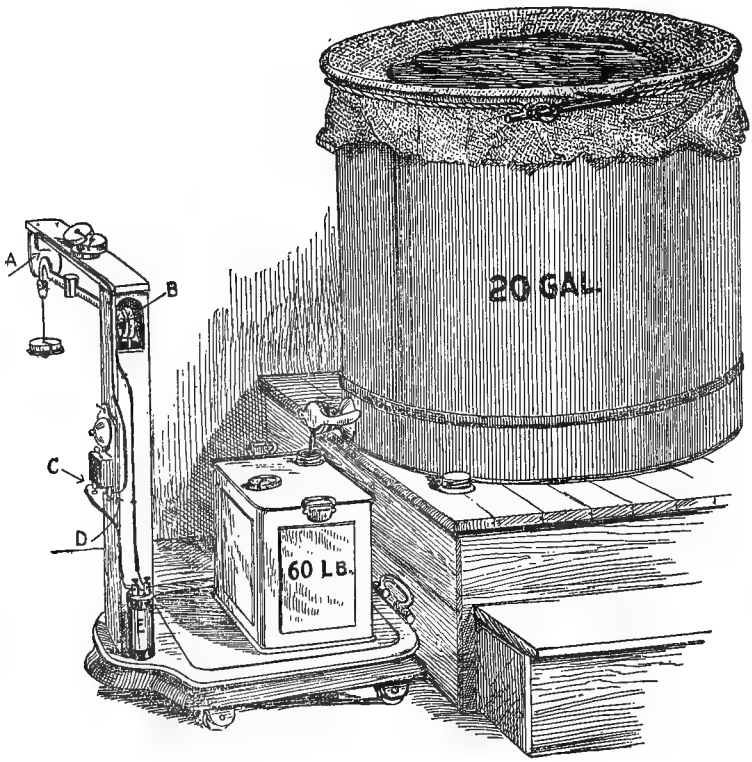


Fig. 2.—E. D. Townsend's arrangement of strainer and scales, illustrat ing the Hutchinson Automatic Alarm.

just above the outside end of the beam. It can be seen that, whe the can is full, the scale-beam rises and the circuit is completed s that the bell rings. It is necessary to have all of the connection tight, as the bell may fail to ring if there are any loose contact We set the scales as usual at the 62½-pound mark to allow for th 60 pounds of honey and the weight of the can, and then lay a tw pound weight on top of the can and turn on the honey and go o

with our work. It can be seen that, when the scale-beam goes up and rings the bell, there will be 58 pounds of honey in the can. We then remove the weight and weigh the honey as usual.

Mr. E. E. Coveyou, of Petoskey, Mich., has made an automatic scale that closes the gate when the can is full. He uses an eight-frame automatic extractor provided with a Holtermann strainer in the bottom. This extractor is located on the platform about 2 ft. above the honey-house floor, and a rubber hose from the strainer in the extractor conveys the honey to the gate on the scales. This rubber hose stops all the vibrations caused by the running of the extractor, and this precaution is really necessary; for if the automatic scales were fastened solid with the extractor the vibration would so affect the flow of honey that some of it would not go into the small openings in the 60-pound cans.

EXTRACTING HONEY IN COLD WEATHER; LEAVING HONEY ON THE HIVES UNTIL FALL, AND EXTRACTING THE WHOLE CROP AT ONE TIME BY WARMING IT ARTIFICIALLY; USE OF BEE-ESCAPES

Several beekeepers in this part of the country have out-yards near the home yard, and draw all the honey home to extract. Mr. F. J. Miller, of London, Ont., Can., has a full equipment at his home yard, including a gasoline-engine, to run his extractor, honey-tank in basement, etc. The honey runs by gravity into the tank, and from the tank into the can on the scales. In this way there is no handling of honey, for it is necessary only to lift the full can from the scales and put an empty one in its place. Everything is arranged with such complete system that Mr. Miller alone, with his one-horse wagon, draws home and extracts all the honey from 500 colonies.

One of the secrets of his success is in having plenty of empty combs, for he does not extract during the honey season, but on rainy days later, when nothing else can be done. He is thus independent so far as help is concerned, for if he gets in a "pinch" he can at least give his colonies more room.

We have drawn home considerable honey to extract, but we found the work a little on the strenuous order since we did not have everything arranged for doing so much at once. With Mr. Miller's system I can see where failure might be turned into success.

Mr. E. E. Coveyou, of Petoskey, Michigan, has his two main bee-yards located along a railroad. He formerly shipped his eight-frame extractor, gasoline-engine, honey-cans, etc., to these yards

each spring, and then, after the harvest was over, he shipped th apparatus and all the honey back to Petoskey where he bottle the honey for the grocery trade. Since his large bottling-room i Petoskey could just as well be used for an extracting-room als he will now ship all of his honey there to be extracted, and he wil therefore, be able to have everything arranged as conveniently a possible. In the spring the empty combs will be shipped back t the yards. Of course, there will be a large freight-bill to pay whe following the new plan—possibly there will not be much diffe ence in the expense of transportation between the new plan an the old; and experience alone can tell which is the more econom cal.

It is evident that, if honey is taken from the hive with th bee-escape, and drawn home, it will be too cold to extract to goo advantage, so it will have to be warmed artificially. The mo feasible way to do this for the average beekeeper is probably t set up a heating-stove in a small room in order to make matte more convenient, and also to save fuel. If this stove were set i the center of the room the supers of honey could be piled cris cross around it. Since the hot air ascends, it is well to build a open platform two feet from the floor, on which to pile the hone for supers placed next to the floor would not get warm, and the would have to be lifted up eventually to a warmer part. We hav used three benches to good advantage, placed around the stove i the shape of a triangle, though leaving an open place throug which to fire the stove. Of course, it would be possible to get th room so hot that the honey would be warmed, no matter where might be placed; but in order to do this the heater should be larg or else the room quite small. O. H. Townsend, of Otsego, Mich has a plan similar to this, only he goes a step further and eve cures that part of the honey that was not capped. Concerning thi he writes as follows:

"For a fall flow of honey, the plan of extracting the hone after the flow is certainly a good one. If the building is put u properly the work can be handled very easily, and the honey e tracted just as well in November as in July.

"One thing must be remembered, however, that the super when they are stacked up, must not be covered tightly or else th moisture will not escape; and any unsealed honey will sour in tw days in such a warm room. In taking off my honey last year found that there were eighteen or twenty Heddon extractin supers that had been put on very late, and these contained prac cally no sealed honey. I left them on the hives so that the be

might move the honey down if they would; but they did not, so I shook the bees from these supers on the ground in front of the hives and set them in my little bee-escape building, which is six feet square inside, with open screened windows. The weather was cool and rainy, so the honey was undoubtedly very thin, although I was not afraid of its souring, because of the cold temperature. I should have put it in my extracting-room; but as I was busy there I left it outside, where it was more out of the way. After these cases had been exposed to the damp air for five or six days it was set into my honey dry-kiln, where it was left just seven days, when it was extracted. I then found that it had been exposed to the warm air about four days too long, as it was possible to get only a part of the honey out of the combs. This thin watery honey was, therefore, evaporated down to the heaviest-bodied honey I ever saw, in seven days.

" My building is built well. It is sheeted with planed unmatched boards, then covered with a good firm quality of building-paper, and finally sided over with ordinary beveled siding. The room at the end for warming the honey is 10 x 14 feet, and is lined on the sides and ceiling with the same kind of paper as that used between the sheeting and siding, this paper being lapped and fastened to the studding with lath, making good tight joints. I find that the paper retains the heat as well as or better than plastered walls, and it allows the moisture to pass through it, insuring a dry room. The paper cost 50 cents per roll of 500 square feet.

" In the center of the room is a box stove with oval sides, the first joint of the stovepipe having a damper. As the fire-door fits tight, the draft can be regulated to perfection, which feature is important, as it allows the heat to be controlled, and prevents the waste of fuel. With wood of fair size the fire can be kept over night if the dampers are properly regulated.

" When the extracting is to be done in cold weather I start the fire a day or two beforehand. As mentioned before, three or four days are necessary to ripen thin honey; and when the evaporation has been kept up long enough the covers can be placed tightly on the supers to prevent the further escape of moisture. There is some danger of melting the combs in the upper supers if the covers are tight; but if one is careful to keep the temperature right, there will be no trouble. I have quite an air-space above the supers of honey in the gable roof, which keeps the temperature of the room more nearly constant.

" I do not depend upon the warm room for ripening all my honeyy, as it is left on the hives all through the season. However,

there is generally some that is not sealed, and this is greatly improved by the evaporation."

When following the plan of extracting the honey late in the year the combs may be freed from bees with the bee-escape or by brushing. At our Kalkaska yard, where both comb and extracted honey are produced in the same super, all supers are taken off with the escape. One day is sufficient to free the bees from a shallow super; but more time will be necessary to get the bees out of a full-depth super. Knowing that the Hutchinsons have had much experience in getting bees out of full-depth supers with the escape-board, I asked Mr. Elmer Hutchinson, of Pioneer, Mich., to tell something of the plan. His letter is as follows:

"We put only one full-depth super over an escape-board, for the bees are rather slow in leaving if more than one are put on at once. We give the bees a few vigorous puffs of smoke, driving down perhaps half of them, and then put on the escapes. If these are put on in the morning of a warm day, from one-half to three-fourths of the supers will be ready to come off by evening, and most of the others will be free of bees by the next morning. I have not noticed any difference in the time it takes, whether the combs are all sealed or only partly sealed; but a few dozen cells of brood will hold the bees in the supers a long time.

"There is one thing about which I should like to caution beginners: Be sure the colonies have a queen; and, no matter how tight the covers are, keep a close watch, for there may be trouble from robbers. ELMER HUTCHINSON.

THE LOCATION OF EXTRACTING-YARDS; THE ADVANTAGE OF A PROTECTED APIARY; HOW TO GET HONEY TO THE EXTRACTING-HOUSE WITH THE LEAST EFFORT

If the bees find as much genuine pleasure in working in a yard where there is good outside protection from prevailing winds as the operator does, then there can be no doubt that this outside protection is a good thing. My boys are always glad when we have finished extracting at one of our yards where there is but little protection; and they look forward gladly to the work at our Pine Lake yard where there is protection from the wind. In our beekeeping experience I suppose we have had yards in at least 25 different places, and in all kinds of locations—some well protected, and others not protected at all from the prevailing winds; therefore we think we have learned the value of protection, from actual experience.

No two of our yards are arranged on the same plan, for the hives are so located as to take advantage of the particular lay of the ground. As far as possible we locate our extracting-houses in the lowest part of the yard to facilitate the wheeling-in of the honey. Wheelbarrow paths are chosen, leading from different parts to the house. At our Pine Lake yard, however, as shown in the engraving, we were obliged to place two of the rows of hives on the ground that was lower than the door of the honey-house. The main path for these two rows is at the upper side of both rows, where the ground is on a level with the honey-house door. In this way, by loading the wheelbarrow at the back of the upper row it is not necessary to run up hill after reaching the path. When the load is taken from the lower row the wheelbarrow is placed so as to be pushed directly up the short hill into the path. We have found that it is easier to push a load up a short steep hill than to push it all the way to the honey-house up a hill that is very much longer, although not nearly so steep.

On level ground it is not difficult to arrange the yard so that it will be convenient to wheel in the honey from all parts; but where the ground is uneven, a little planning must be done in order to make the work easier. If the ground is very uneven it is not best to try to keep the hives in rows, but to group them to some extent; for the first thing to do is to secure good wheelbarrow paths, of which there should be three or four leading to the honey-house. These paths need not necessarily be straight, for it is many times much easier to travel a little further in order to avoid a grade.

Having these main paths selected, the yard will thus be divided into three or four groups of hives. I prefer to have the hives placed facing the south or southeast. But in the majority of our yards we can pay but little attention to the direction, and the hives, therefore, face every way except the north. We see no difference in results, and it is possible that the colonies would do as well if the entrances were toward the north; but we always avoid that direction, perhaps from the force of habit.

Parallel with the lay of the ground we level pieces of ground 20 inches wide and 4 feet long, which is large enough for two hives placed side by side. The 2 x 4's 4 feet long are laid down flat, and leveled. In this way the foundation is made for two hives. The front of the hives should preferably be ¼ inch lower than the back so that water will run out of the entrance. We formerly laid great stress on having our hives in rows all facing the south; but we find that this plan, in the majority of instances, was not satisfactory,

on account of the lay of the ground. Furthermore a greater per centage of young queens were lost on returning from their mating flight, and the bees themselves mixed up much more. Now th groups may be placed five or six feet apart one way and ten o twelve the other. On this plan the groups are really in rows whicl are not straight, perhaps, but irregular, to conform to the ground Possibly some might think that this arrangement would not b pleasing to the eye; but there is really hardly any other plan tha would look well on rough ground. The wheelbarrow may be ru between each group of hives and also between each row; and it i an easy matter to load the honey very close to one of the mai paths leading to the extracting-house.

In renting ground for bee-yards it is not always possible t secure a desirable place to set the hives. Our Kalkaska yard, a shown in Gleanings, 1908, p. 1000, is located on a side hill. How ever, we first made four terraces on which the rows of hives migh be placed. Since the hill slopes to the southeast, the hives face i all directions between south and east. The honey-houses were se about midway at the lower side. A path was made across the ter races in the middle, dividing the yard in two parts. When ex tracting we work from the sides of the yard toward the center i order to shorten the distance to the honey-house. If we set thi house at one side of the yard it would be necessary to wheel the honey, or at least the greater part of it, twice as far.

HONEY-HOUSES; A DESCRIPTION OF SOME OF THE HONEY-HOUSES IN NORTHERN MICHIGAN, AND AN OUTLINE OF THE METHODS USED.

As our yards are all located on rented ground, so that frequent moving is necessary, we build the honey-houses in sections. The floor is in halves; the sides and ends are separate, and bolted together with two bolts in each corner, and each side of the roof is built independently of the rest of the building so a half can be taken off at a time for moving.

A 32-inch door is put in one end, without screen or glass, for door-screens attract the robbers so that some of them are sure to dodge in when the door is opened. Centrally located on both sides of the building, next to the plate, window-holes are cut, and covered with wire screen nailed on the outside with lath strips to hold it down. These window-holes are boarded up with a framework which slides to one side to let in the light. As all the work at the outyards is done during warm weather, no glass is necessary.

The framework above is of 2 x 4 material, planed on all four sides, while that below the floor is 2 x 6, not planed. The siding is of single boards planed on both sides and nailed up and down; the roof-boards are the poorest of the same material. See Gleanings for Oct., 1906, page 1242.

TAR BUILDING-PAPER TO LINE BEE-PROOF HONEY-HOUSES

To make our honey-houses bee-tight we have tried several kinds of building-paper, but have decided that tar paper is the best. We put it on with lap, being sure to have it lap well at the joints, and to fit the corners perfectly. Wherever there is likely to be a bee-space or opening we are especially careful. We have never yet been able to find a carpenter who would do the work well enough, and we believe that the beekeeper should attend to the papering himself, therefore, whenever possible.

A honey-house papered April 1st will have lost most of the smell of tar by the time much work is done, so those who do not like the smell need not hesitate, for it is of short duration.

Bees, mice, and ants dislike tar paper, and hardly ever go near it. The mice never gnaw it and let in bees, as they will do if other kinds of paper are used. Some of our honey-houses have not had a mouse in since tar paper was used; but they make nests of the white building-paper we used to use, and some of the houses had to be repapered each year. The worst mistake we ever make was to paste on the paper. The mice seemed to follow us and eat the paste as fast as we could put it on—of course, tearing the paper meanwhile. When the house is lined with tar paper we never see any ants.

THE CHAPMAN HONEY-HOUSES

At his home yard Mr. Chapman has a fine new honey-house and storeroom, with his bee-cellar under it. As this is his headquarters, much of his material is kept there until wanted at the outyard. While this house has all of the latest appliances to be found in most home-yard houses, I want to talk most about the one at his outyard, which is, perhaps, ten feet square. There is room only for the operator, extractor, tanks, etc., so the team is hitched to the big wagon, and the honey-cans and such things as will be needed for extracting are hauled to this yard in the morning. The honey is taken off the hives, extracted, strained through cheese-cloth, canned up, and set out of doors until the day's work is done, when the bees will have stopped flying. The team may then be driven to the house to get the honey, for it is drawn home each

night. By this plan the honey is canned as fast as extracted, so all of the aroma and best flavor are retained. Such a plan is a very good one where the outyard is so near that the honey can be drawn home every day. Some of our own yards are worked much on the same plan, although we do not have to draw all the honey home each night, having plenty of room at the house to store it.

Mr. Chapman, not having room in the house to store the combs after extracting, sets them out for the bees to clean up immediately. A load of the wet combs just extracted is taken out to one side of the yard, and placer criss-cross for the bees to clean. The writer happened on the scene one July day when the extracting was going on; and as the flow from raspberry had ceased, there was nothing for the bees to do but to carry in this honey from combs. While there seemed to be quite an uproar, the honey was being taken without any sign of robbing.

When the season is over, as there is no place in the extracting-house to store the tools over winter they are all drawn to the main house at the home yard, as are the empty combs after they are cleaned of the honey that is left on them after extracting.

THE COVEYOU HONEY-HOUSE

Mr. E. E. Coveyou, like many of the outyard beekeepers of Michigan, uses some of the abandoned lumber-camp buildings for his honey-houses. He does not try to keep the bees from entering his honey-house, but plans to do the work at a time when the robbers are not likely to bother much. The honey is taken off the hives during the day and piled up in the yard, being covered so the bees can not get to it. Then, toward night, after the sun has warmed the honey, it is taken into the honey-house and extracted with his big eight-frame automatic extractor. It does not take long to do this, and the work is done so late in the day that the robbers do not get started much before it is too late for them to fly. After all the honey that was taken off is extracted and canned the combs are piled up and covered so the bees can not get to them. The extractor and capping-box are also closed bee-tight. This is not a very desirable way of handling a crop of honey, and is the only flaw I have been able to find in Mr. Coveyou's methods. However, I understand that he will abandon this plan next season for another one which I will describe later.

KIRKPATRICK'S HONEY-HOUSE

Mr. Geo. H. Kirkpatrick, Rapid City, Mich., who has several yards of bees in the raspberry region, builds all his extracting-

houses small, and depends on storage room elsewhere for his honey and combs. His honey-houses differ from Mr. Chapman's in that he puts the honey he uses into a large honey-tank, instead of directly into the cans. The houses are built about 12 feet square, bee-proof, and about a third of the floor space at the back end is let down three feet lower than the main floor. In this lower part are located the tank and scales, so arranged that the honey from the extractor runs directly into the tank, and from this tank into the 60-lb. can resting on the scales. The honey is all extracted after the season closes, and is in good condition to can as soon as extracted; but it is left in this large tank over night, then skimmed and drawn from the bottom. This makes very clear nice-looking honey, and handled this way it is of good quality. While Mr. Kirkpatrick is a convert to the better way of canning the honey direct from the extractor, he has not changed his outfits yet, but probably will do so during the coming season.

THE HUTCHINSON HONEY-HOUSES

The Hutchinsons have their outyards near some of the abandoned lumber-camps, so they build over the camp-buildings for a honey-house. Usually the camp-buildings are much larger than necessary, and partitions are run across to make the bee-proof honey-room. Besides the main exracting-room, there is a small room of suitable size for heating the honey before extracting. This room is lined with paper, to retain the heat from the large oil-stove used to heat the honey. The honey is taken off with escape-boards, and stored in this room where this oil-stove is lighted the night before they intend to extract, with the result that, in the morning, the honey is in much better shape than that just from the hive. Honey just from the hive, especially on cold mornings, does not extract very clean, and requires a long turn of the extractor to get it at all.

A few times I have warmed the honey to be extracted; and if things are arranged right, there is no other way that is so satisfactory. The honey is just a litlte warmer than that from the hive in the hottest weather, which makes it about as thin as water, and of course it is thrown out of the combs much easier, and the combs are extracted very dry.

EXTRACTING IN THE OPEN AIR

At one time I worked ten swarms of bees on shares, for a neighbor, and I did the extracting out of doors under a shade-tree. Every thing was kept covered up as much as possible to prevent

robbing; then a smoker was kept going, and the assistant would keep the smoke where it would do the most good. This yard of bees had not been handled, and the colonies had not learned the robbing habit, so they were not very bad to commence with.

THE IDEAL HONEY-HOUSE

The ideal honey-house for a hundred-colony bee-yard would be a building 18 x 24, lathed and plastered on the inside. It should be built at the lower edge of the bee-yard, to facilitate wheeling the honey from the yard. It would be better if the gentle slope of the ground were to the south or southeast. I would build the end of the building toward the bee-yard, with a good wide door at both ends. The ground at the back should be about six feet lower than the front, to allow a platform wagon to stand with the top on a level with the honey-floor for convenience in loading and unloading honey, supplies, etc.

Two-thirds of the floor on the end toward the front or bee-yard should be built on a level with the ground at this point for convenience in wheeling in honey; then the third toward the back end would be built two or three feet lower than the front or main floor. The front floor would be the main workroom where the extractor, uncapping-box and combs are kept. The lower floor would be for the honey-tank, scales, honey-cans, etc., and the distance this lower floor should be below the main floor would be determined by the height of the tank to be filled; for the extractor would be set at the edge of this upper floor, with the gate projecting over so the honey could run direct from the extractor into the tank, then from the tank to the 60-lb. can on scales. The shallower the tank, the less difference there would have to be between the two floors.

THE PROPER CARE OF EXTRACTING-COMBS; DOES IT PAY TO GIVE BEES COMBS WET WITH HONEY?

I formerly practiced spacing our combs after the last extracting, and criss-crossing them out of doors for the bees to clean up, as this was the way some advised. In some cases a part of the combs would not be cleaned by the bees as usual. When these were given to the bees to be filled the next season, we never could see any difference in the quality of the honey, whether the combs were cleaned or not. Some of the honey left in the combs candies, while the rest apparently disappears; at any rate, none shows up in the honey at extracting time. I take the precaution to give combs, from which dark honey has been extracted, to the bees,

before the season opens, as I have explained heretofore. I used to think I was doing the bees a favor by giving them these wet combs to clean outdoors; but now I'm very sure it is an actual damage to them rather than a help; for with their mad scramble for the honey they use up valuable vitality, and this, too, at a vital time late in the season, when all their strength is needed to carry them through the winter. Then I would rather have the honey left in the combs than have that dirty purging smeared over the stories and frames. The bees are so eager for the honey that they overload, thus causing them to purge before taking wing.

Upper stories set back on the hives are cleaned all right; but the honey is stored right back in the same combs, so this method is a failure.

Toward the end of summer, or in this location early in September, bees begin to curtail brood-rearing. When this is going on, and as the brood-nest begins to grow smaller and smaller each day, instinct teaches the bees that a period of rest is in store for them. At this time they manage the interior of their hive as if they had full knowledge of the rigorous winter that is in store for them, for, as the brood hatches out for the last time in the fall, they busy themselves carrying honey from the outside combs and filling in those cells made vacant by the hatching of the bees. This carrying-in process of honey from the outside combs is continued until there is as much as ten pounds of honey placed in these empty cells in the middle of the brood-nest. If the honey in these outside combs is of good quality, all is well; but if it is of an inferior quality, and the colony does not winter perfectly, there is likely to be trouble.

Knowing of these conditions, and of the instinct of the bees, we take advantage of this period to feed all colonies that are short of winter stores. If the honey in these outside combs is of an inferior quality we have fine results by feeding every colony ten pounds of sugar syrup. After the last extracting, the yard is gone over, the colonies " hefted " to see if they have stores enough to last them until the main honey-flow next June. Any colonies falling short of 25 lbs. are marked " short," and the amount of stores necessary to bring the weight up to 30 lbs. is marked on the hives. In estimating the amount of stores needed, but few colonies are looked into—just enough colonies are looked into to get the run of how they are as to amount of stores. Colonies with very old combs are much heavier than new swarms; and taking this into consideration it does not take long to get on to the knack of estimating very correctly, since all the new colonies are marked.

FEEDING THICK SYRUP FOR WINTER

Knowing the amount of stores needed, it is best to buy 15 to 20 per cent less of granulated cane sugar than the amount that is to be fed. The thicker we can make the syrup, and get the bees to take it, the less sugar it will take to make up the shortage. While bees will take a sugar syrup thicker than three parts of sugar to two of water, we have had rather better results with this portion of each. This makes a syrup that weighs in the neighborhood of 11 lbs. to the gallon; and as good honey weighs 12 lbs. to the gallon, there is but one pound of moisture to the gallon for the bees to evaporate. Of course, there are other losses, so if the colony needs 20 lbs. of stores, more than they already have (10 lbs.) they should be fed 25 lbs. of the syrup. This would put it in good shape, and it would not need looking after again, in regard to stores, until the white-honey flow the next June.

In making syrup of granulated sugar we use a boiler large enough to cover the whole top of the stove. This is made of galvanized iron, and is what we use to melt four 60-lb. cans of honey at a time. A wash-boiler might do, but would not be so fast. We weigh in the water; then, as the water comes to a boil, add the sugar, keeping the contents of the boiler well stirred, after the sugar is added, to prevent it from burning to the bottom. As soon as all the sugar is melted we empty it into a tank with a gate at the bottom, which is elevated, in order to run the syrup from the tank, to a 60-lb. honey-can on the scales. We set the scales to weigh 55 lbs. net to the can. This will fill the can about the same as 60 lbs. of honey.

The syrup is drawn to the outyards in these 60-lb. cans, and is not weighed again. We feed in Miller feeders that hold 20 lbs. Four or five tin pails are provided to use in feeding. We weigh 10 and 15 lbs. of the syrup in these, and mark the levels on the sides of the pail. The combination of these two weights will make any weight we need, and it is much more convenient than weighing the second time, besides being accurate enough for the purpose. As we do not feed a colony less than 10 lbs., the hives are marked 10 lbs., 15 lbs., 20 lbs., 25 lbs., and 35 lbs. short, the latter weight showing that the colony has nothing but empty combs. The colonies marked to be fed from 10 to 20 lbs. are fed all their allowance at once. The few that are marked to be fed 25 to 35 lbs. are given their additional 5 to 15 lbs. as soon as their feeder will hold it. To expedite matters, the colonies that have to be fed most are fed first; so if any have to wait, it will be those that do not need so

much, and may be fed when the first-mentioned colonies are getting their second feed.

We buy and keep, for the purpose, shallow supers with strips of tin nailed on the lower inside ends for the feeders to rest on. When not in use they pile up to good advantage, and, with a hive-cover on top, are kept away from the dust and flies.

CHAPTER X.

Spring Management

PROTECTING HIVES WITH PAPER; PREVENTION OF MIXING WHEN COLONIES ARE SET OUT OF THE CELLAR; FEEDING IN THE SPRING; DOES IT PAY?

If I were wintering colonies in small hives with sealed covers, and had a well-protected location, I do not think it would pay me to paper the hives; but if I were using a hive larger than the ten-frame Langstroth I would paper in all cases, for I do not think that the large hive has as many bees in comparison to the size of the hive as the eight and ten frame hives have. If this is the case, the extra room to warm during the breeding season of spring would, in my estimation, justify the papering. If a yard of bees is located in a windy place (and I think the majority are) then it will also pay to paper.

COMPARATIVE ADVANTAGES OF BLACK AND WHITE PAPER

It is with a good deal of satisfaction that I find Gleanings showing white paper for protecting colonies during winter and spring. Although I do not winter bees in papered hives I have been almost alone in the use of white-felt building-paper for spring protection; and while the journals have been recommending tarred paper for spring protection I have been using the white with good results.

The reason that I have " steered clear " of black paper for papering hives is that, several years ago, I had experience with hives painted a dark color, some of which were of the chaff pat-

tern, but built with a thin front painted a dark color. The results were that these dark-colored hives would absorb the sun heat so as to attract the bees out on many cold days, so that they rarely wintered a colony in good condition. They were, therefore, abandoned for a better kind.

Mr. S. D. Chapman, during the spring of 1906, wrapped every other hive in his home yard, consisting of over two hundred colonies, with tarred paper. By having half the colonies in the same apiary wrapped with paper and half not wrapped he was able to give the plan a very fair test. All of the colonies were wintered in a cellar, and Mr. Chapman is very particular to have all light colonies fed early in the fall for the purpose of having all the covers sealed down so there will be no chance for a draft through the hives after they are set out of the cellar in the spring. The location where this test was carried on is well protected from the prevailing winds, especially those from the north and west.

The ones that were covered with the tarred paper absorbed the heat from sun to such an extent the bees were lured from the hives on days that were too cold for them to fly. This meant that the colonies in the papered hives at the beginning of the honey-flow in June were not nearly so far advanced as those in hives that were not protected. In view of this, Mr. Chapman has decided that no extra protection is needed if the yard is well sheltered from the winds, and if the hive-covers can be well sealed the previous fall.

White paper does not cause the hive to become so excessively hot when the sun shines as the black paper does; and if it has been well folded down and fastened at the bottom of the hive the bees are kept as warm as is necessary. Colonies so protected went through the severe freeze of May 10, 1906, without the loss of a particle of brood, while many colonies in hives not papered lost heavily, and some of these were so greatly reduced that they were able to gather no surplus honey that season. Generally speaking, night is the time when the extra protection is needed, for the air during the day is warm enough. Since white paper at night is just as good in all respects as the black, it is obvious that it is the better material to use, since it does not absorb the heat of the sun during the day and make the hive too hot.

I use white-felt building-paper, and it is so cheap that I throw it away and buy new each year. It is true that any sheets that might not be torn could be rolled up and saved; but the new paper folds so much better than the old stiff paper kept over from the year before that I do not think it would be much of a saving

to try to use the old. This white-felt paper comes in rolls 36 inches wide, and costs about 65 cts. a roll. One roll of paper this width will cover about 35 hives, and it is not hard to see that, if the paper is of any value at all, the expense of less than two cents per hive can not be considered. The tarred paper is usually but 32 inches wide. While this might do for an eight-frame hive it is not wide enough to suit me for the ten-frame size.

HOW TO WRAP THE HIVES

If the hive-cover is sealed down I put the paper over the hive —cover and all; but if the cover has been loosened, or if there are any openings at the top of the hive, I remove the cover and put the paper next to the bees. The paper can be used most advantageously in this way, for it comes down to the bottom of the hive in better shape. Furthermore, it is easier to fold the paper around a hive that has no cover. The best arrangement of all is a hive with a thin super-cover that comes just flush with the outside all around. I remove the outer cover and fold the paper directly over the inner cover, being careful to put it on smooth, so that there are no wrinkles at the sides. I then fold over the ends in such a manner that the water can not possibly run down between the folds. I secure the bottom of the paper with a piece of lath as long as the side of the hive, and fasten it with a nail in the center. These pieces of lath should be tacked at the bottom of the paper, one on each side.

The lath have the advantage over the string in that the lower edge of the paper is held perfectly tight against the hive at all points, so there is no chance for a circulation of air between the paper and the hive. If nothing is used but a string tied around the bottom of the hive, there is likely to be a loose wrinkled edge where the wind and cold air can get in. If the work has been done well, there is no chance for the heat from the bees to escape except through the entrance of the hive. I believe this to be a very desirable condition.

We wintered 325 colonies of bees in a cellar in Charlevoix Co. Nearly all of the covers were loosened so that there was some ventilation at the top.

The yard in which these colonies were placed in the summer was well protected; and when the hives were set on the summer stands the propolis was cleaned from the upper edge of the hive and from the under side of the cover. A sheet of felt paper the size of the outside of the hive was put on, held down by the cover. A ten-pound stone was finally placed on top; and it is my opinion

that, since the soft paper fills up any small opening beween the hive and the cover, there is no more chance for draft than in a hive with a sealed cover. However, in all our yards where the wind is likely to be strong the hives will be papered according to the plan given before.

REMOVING BEES FROM THE CELLAR

In removing colonies from the cellar, no attempt is made to set them on the stands they occupied the previous season; for I have found that it makes no difference as to the mixing of the bees whether the hives occupy the same stands year after year or not.

Unless precautions are taken, the bees will drift to one side of the yard when the hives are taken from the cellar, all of them trying, apparently, to enter a very few hives. This means that, in some cases, a hive will be deserted; and even the queen, thinking she is being left alone, will fly out and join the busy throng, trying to get into the few hives at one side of the yard. I have had this experience two or three times; and after the mixing is started I have found that it pays to contract the entrances of the strong colonies so that only a few bees can emerge at a time. When this is done the flying forces of all the colonies are more nearly equalized. After this the colonies should be shifted about to some extent; that is, if a certain hive already has its share of bees, and if more bees keep coming to it so that the prospects are that it will become overcrowded, it should be carried to some part of the yard where the hives are not getting their share. One of the hives light in bees is set in the place occupied by the strong colony. This should be kept up until all the colonies are as near alike in regard to strength as it is possible to get them. After finishing such work, however, it is generally found that the plan is not very satisfactory; hence it is well to prevent such drifting on the part of the bees in the future.

HOW TO PREVENT DRIFTING

In order to prevent this state of affairs it is necessary, first, to understand what causes the trouble. Improper methods in wintering account for some of it; for, if the bees are "just dying" for a fly, they are more likely to boil out of the hives without carefully marking their locations. This, of course, means a general mix-up.

Removing the colonies from the cellar on a very warm day also tends to cause drifting. The disturbance and the warm air together cause the bees to leave the hives in such numbers that they are almost demoralized. A large entrance is detrimental in this

case, for it allows the bees to leave the hives too rapidly, so that, in a short space of time, the air is almost full of lost bees. A high wind aggravates matters, for this surging mass of lost bees may be blown to one side of the yard. It would seem that the leeward side of the yard (the side toward which the wind blows) would get the greatest number of bees; but such is not the case. I have found that the windward side gets the bees—that is, the side toward the wind.

Hubbard Bros., of Boyne Falls, Mich., had a peculiar case of drifting last spring. Their yard is located on a ridge, one side of which slopes to the east and the other to the west. The hives were set out of the cellar in the night, and in the morning the sun shone brightly and the bees on the east side were attracted out by the morning sun, and were flying strongly before those on the west side even started to fly. The result was that the bees from the west side were so attracted by the great commotion on the east side that a good share of them went over and mingled with the flying throng so that there were finally entirely too many bees on the side of the yard which got the sunlight first, while the other side had but a few. It seems to me that in such a case I would try shading the east side until the sun is high enough to shine on all the hives at once; and then when the bees have begun to fly to some extent the shadeboards, or whatever had been used for shade, could be removed. In this way it seems to me the flying of the bees could be regulated, especially if the precaution is taken to contract the entrance down to about ⅜ x 2 inches.

It must be borne in mind that the bees from the strong colonies are the ones that make the great demonstration at the entrance, so that bees from other weak colonies are attracted to them. I know of no better way to regulate this than to contract the entrances of the strong colonies as explained above. This means that the bees from such hives can not fly any faster than those from the weaker ones, so that all are flying with about the same force.

If the hives are removed from the cellar in the early part of the season, before the weather gets too warm, there will be less mixing on the part of the bees when they fly for the first time. This is a good point in favor of removing the bees earlier, for such mixing is quite a serious matter to the honey-producer.

THE BEST TIME TO REMOVE COLONIES FROM THE CELLAR

Whenever the indications are that the next day will be a suitable one for the bees to fly I go to one of the clamps and

remove all but about two inches of dirt from the straw that covers the hives. This is left on so that the bees will not try to fly before they are finally uncovered. In the evening, after it is so late that bees would not try to fly from the pit, I remove the rest of the dirt and the straw. When this is done, there is quite a demonstration among the bees on account of the fresh air which reaches them; but, since it is now so dark that they can not fly, there is no mixing. By morning the bees will have quieted down, since the nights are usually cool at this time of the year. As soon as it is light in the morning I quietly place the hives on the permanent stands, and hardly a bee will come out. By this time they are so used to the fresh air that they usually fly very moderately, and rarely get mixed up. An ideal day for the first fly would be one when the air is warm but the sky hazy. With these conditions the flying is very moderate and there is no mixing.

Any colonies that are light in stores are placed in a row by themselves near the honey-house. This saves a good deal of work, and such weak colonies are not so likely to be forgotten as if they were placed in some remote corner of the yard, for they may be seen every time the honey-house is entered. On this account they get better care than if they are scattered all over the yard.

STIMULATIVE FEEDING DURING THE SPRING NOT ADVISED

For some reason, here in Michigan there do not seem to be many who practice spring feeding for stimulating. I can not say whether this is on account of the bad weather in the spring, which makes it difficult to get bees to take the feed when they need it most, or whether experience has taught the beekeepers of this locality that a colony with brood-nest made rich with honey the previous fall is in better condition. All indications point to the latter cause.

There is one beekeeper, however, Mr. E. E. Coveyou, of Petoskey, who thinks it pays him well to feed for stimulative purposes during the spring. I will let him tell his experience in his own words. He says:

" After the weather in the spring is settled, and the bees have begun brood-rearing long enough so that young bees are hatching, I aim to keep them breeding as fast as possible. Lest the weather should turn cold, or a frost come as it did last spring, I proceed to feed every colony at once. My experience last spring was quite serious. In one apiary 131 colonies that were fed continuously before and after the frost gave an average of 87 lbs. of honey to the colony. Another apiary, six miles from Petoskey, of 118 colo-

nies, was not fed, although it was otherwise in just as good condition, for each colony had a good deal of brood started before the frost. I went to this apiary about a week after the frost, and, to my sorrow, I found that the bees had dragged out the drones, and the conditions seemed to be more like those in September. This was when the raspberries were just coming into bloom. The yield from this apiary was 30 lbs. of surplus per colony; and if there was any difference in the two locations, this last apiary had the better one. I am sure that I could have obtained 4000 lbs. more honey from this yard if the bees had been fed 500 to 1000 lbs. of sugar syrup in the spring."

CHAPTER XI

Making Up Winter Losses

A REVIEW OF SOME OF THE SUCCESSFUL PLANS FOR MAKING INCREASE

Comb-honey producers may be striving to keep down increase, but extracted-honey men are more interested in plans for making up winter losses; for if their bees are handled as they should be there will not be enough natural swarms to make up for the loss through the year. Each season, therefore, there will be some artificially made swarms, and the purpose of this article is to show how to do this to the best advantage.

There is a rule to be observed in the making of artificial increase that is very important. The brood should be left undisturbed for the first eight days after being made queenless to allow the bees time to cap all the unsealed brood. This rule or principle is observed in the Somerford, Alexander, and Chapman plans, all of which will be considered here; and if beekeepers would keep this thought in mind, and work out a system of artificial swarming in which no unsealed brood is carried away from the parent colony, much better success could be expected. It is well known that, when bees are carried to a new location in the process of making artificial increase, if the apiarist is not well versed in the

art of making bees stay where they are put in the different ma ipulations, large quantities of unsealed brood will be lost by t bees deserting the hive in the new quarters and returning to t parent hive. Let us now consider the

SOMERFORD PLAN FOR MAKING INCREASE

This is a good one; but in order to work this system to t best advantage, one ought to have a very good stock of bees. T idea, in brief, is as follows: During either a natural or artifici flow of honey, the queen is removed from a colony that is ve strong and in good condition to build queen-cells. In ten da when the queen-cells are ripe and all the brood sealed, the colo is ready to be divided.

The average beekeeper will have no trouble with the plan u to the time the division is to be made; but the difficult part com when the attempt is made to compel the bees to stay in their respe tive places on the new stands. We will suppose that it is early the season, and that two frames of brood have been selected wi at least one good queen-cell, and that the bees from a third fra have been shaken on to the first two frames. The difficulty no consists in trying to make a good percentage of these bees sta with the brood on the new stand.

In preparing the hive for these little colonies, a lath is naile over the entrance through which a ⅜-inch hole had previousl been bored, which hole, however, is now corked up. The thir night after the little swarm is made, and after the bees ha stopped flying for the day, this cork should be removed from t ⅜-inch hole at the entrance, when the bees will be found ready t come out; for during the confinement they will have been gnawin at every opening where a particle of light could be seen. On th account, if the entrance were thus opened during the middle the day, every bee that could fly would rush out and many of the would go back to the old stand, for it would be natural that the should prefer the old home to the prison from which they ha just escaped. The consequence would be that but a very sma number would be left at this new stand, with about as many be at the old stand as there were before the division was made. Suc a small swarm or nucleus would have a hard slow pull in order t get in shape for winter, and many times it would have to be helpe The small entrance, consisting only of a ⅜-inch hole, and also t time at which this entrance is opened, makes the plan successfu where it otherwise would be uncertain and perhaps an actu failure. For instance, if this ⅜-inch entrance were opened la

in the day after the bees had stopped flying, there might be, perhaps, a cupful of bees that would crawl out of the entrance, for they are quick to realize that they are no longer prisoners, and the glad tidings go through the hive like magic. However, since it is so late that the bees will not fly, there will be practically none that will go back to the old stand. By this time the young queen has hatched, and the bees soon begin to carry out dead bees, etc., and to clean house generally. In other words, things have changed suddenly, for the bees that were prisoners, and were thinking of nothing but trying to get out, now begin to think about keeping house, and during the first night of liberty much is done along this line, sc that, when morning comes, and the bees take their first flight, they no longer try to go back to the old location, but mark the new one, so that but very few go back. The consequences are that the nucleus will be in good condition, and very thrifty, when it might otherwise have been almost a failure.

In making nuclei with this Somerford plan we start a few artificial queen-cells at the time of making the divisions, which cells are from our best stock, so that if, for any reason, extra cells are wanted they will be on hand. It sometimes happens that it is convenient to use a colony for increase that we would not care to breed from, and it is less work to make artificial cells than to cut them from one comb and transfer them to another one, as would have to be done if following the Somerford plan, for many times all the desirable cells will be on only one or two combs of brood. Furthermore, only a few of the cells in such colonies will be good enough to use, the inferior ones being torn out when the division is made.

HOW THE QUEEN-CELLS ARE PRODUCED

With the number of colonies that the honey-producer has to select from, there is no trouble in picking out colonies for cell-builders that are especially adapted to the work. I have found that nervous bees are better cell-builders than the more quiet strains, so in selecting the cell-building colonies pick out hybrids or bees that tend toward a darker-colored strain. After making this selection, see that all the cell-building colonies are strong in numbers. Then remove the brood and the queen from each, being sure, however, that there is plenty of honey left. However, it sometimes happens that there is brood in nearly all of the combs so that, when these are taken away from them, there will be almost no honey left, and thus it will be necessary to give two or three frames of stores, filling up the empty space with empty combs with

the exception of one or two in the center of the hive. In this sp in the center, place bars containing empty cell cups, in order t these may be cleaned and made ready by the queenless bees for larvæ to be transferred later. The first day after the bees h been made broodless and queenless they will be anxious to brood to start cells with.

We are now ready to transfer the larvæ from some of t best queens to the cells which have been cleaned out by the que less bees. A transferring-needle, jelly-spoon, plenty of queen-ce containing royal jelly, etc., will be needed. There is enough ro jelly in an ordinary queen-cell to prepare ten cells for larvæ. is important to get the larvæ transferred to the jelly in the p pared cells so nicely that the bees are hardly able to tell it fr their own work. The cell-bars containing the transferred lar are now placed in the queenless colony to be started; and after th have been accepted, in a day or two they are taken from the que less colony and placed in the second story of a powerful colo above a queen-excluder, where they may be finished. Two fram of brood should be lifted up from the lower story, and placed o on each side of the cell-bars in order to make sure that the be do not leave the cells and go below, which might happen on a co night. With the two frames of unsealed brood it is quite certa that the cells will be well taken care of. I am sure that the wo will succeed better if the cells are started in a queenless colony the way described, rather than in an upper story over an exclud Of course, after the cells are started they can be transferred such an upper story over an excluder to be finished.

For the honey-producer who raises only the queens that needs to make up winter loss and increase, and when the regul brood-frame is used, no tools except those that I have mention will be necessary. These are so few, and thir advantages so grea that no one can afford to be without them. In this way a que can be supplied any time during the season.

THE ALEXANDER METHOD OF MAKING INCREASE

This is a very good system, for, as in the Somerford metho the brood is left with the full force of bees until it is all cappe This, of course, means a saving of all the unsealed brood, and th can not be said of some of the other methods which are being us where the unsealed brood is moved to a new location from whi many of the bees that were taken with it go back to the old loc tion, leaving the brood to take care of itself.

With the Alexander plan the queen-cells are all produced artificially, as explained above. By the way, the brood-nest above the excluder is one of the finest places to get cells finished after they have been started in the queenless colony. A ten-day-old cell should be ready to give the brood four days before it is set on the permanent stand. In this way the young queen is ready to fly the first day after the division is made, and she becomes a laying queen in another week.

We made up some winter losses by the Alexander plan of increase just at the commencement of the clover flow. In this case the brood-nests were all ready, some having honey where the bees had died before it was consumed. The queen and one frame of brood were put in the center of one of these sets of brood-combs, and a queen-excluder was put on top; then the brood and bees were set over this so that all were on the old stand. In one week a ripe cell was given the bees in the upper body, and on the eleventh day this upper body was set on a stand of its own with a virgin queen ready to fly the first favorable day. This worked well, for all were in good shape for winter, there being no weak inferior colonies likely to be robbed out at any time. There was one objection, however—the plan was expensive. It can be seen that a set of brood-combs to be filled with brood and honey is equivalent to a set of frames containing the best clover or raspberry honey, and this amount of honey would be worth about $4.50. It is evident that we could go into the market and buy bees for less money than this.

Our next plan was to wait until near the close of the clover season, when the honey-flow would last but a few days longer, it having already begun to slacken. At this time the plan just described was carried out, and it worked better, for it gave the advantage of the honey-flow in which to have the cells prepared and introduced, and it allowed also the colonies to get in a little honey so that they would be in very good shape, but of course short of stores, although they usuallly would have enough to last them until the time to feed up with sugar syrup for winter.

While some of our winter loss is still made up on this last plan we have another plan that we like better. At the commencement of the honey-flow the division is made and the cell is given in four days, and the brood set off on its own stand on the eighth day after the division. At this time the brood is all capped so that there is no loss there. While this method takes three days more of hatching bees away from the colony that is left on the old stand, which is our honey-gatherer, we make two colonies from the brood

by dividing it in the middle, giving each half an equal part of the bees, brood, and combs of honey. Each half is also given a ripe queen-cell; and although one of them will have the virgin and will, therefore, destroy the cell, it saves work in the end and is the better way. By making these nuclei of the divided brood early, these breed up rapidly and make just as good colonies for winter as if the brood had not been divided. There is this difference, however; that is, brood not divided in halves in the way I described might have enough stores for winter, while the two halves of the divided brood would have to be fed some syrup to carry them over to the next season.

While this latter plan costs only half as much honey in the first place as does the plan first described under the heading, "The Alexander Plan of Making Increase," yet more sugar has to be fed for winter stores, but not enough more to offset what is gained, and it is, therefore, a very good plan. It will be noticed that, in the plan of making two nuclei from the brood of one colony, only half as many colonies need to be disturbed to make up the winter loss, and in those which are disturbed to make up such loss, the colonies left on the old stand containing the working force are in about the same condition after the brood is removed, as to the amount of honey that would be stored, as a new swarm would be if hived on the old stand.

THE ALEXANDER PLAN AS WORKED FOR INCREASE

In making up winter losses I have advised the use of drawn combs. In making increase, frames of wired foundation are used instead. Sometimes it happens that we have both increase and winter loss to make in the same yard, and in such a case a frame of brood containing the queen is placed in a hive containing frames of foundation. A queen-excluder is placed on top of this, and then the brood over the excluder so that all is on the old stand just as usual. On the eighth day the brood is set off on a new location, and is used to make up the winter loss as I have explained.

The difference lies in the fact that no story of extracting-combs is given the colony until the foundation has all been drawn out and filled with honey and brood; for, were we to give all the comb room the bees would use above, the foundation would be neglected, and probably there would be no colony at all, so to speak, for the bees might not have more than two frames of foundation drawn out, nearly the whole force of workers being above. In order to avoid having seven-tenths of the hive below untouched.

therfore, see that this foundation is all drawn out before stories of extracting frames are given.

In the above discussion I have purposely said nothing about a flow of buckwheat honey, having taken into consideration only the white-honey flow of June and the fore part of July. Here at Remus we get some dark honey from the buckwheat and aster. Some of our winter losses in years past have been made up during this flow. While it is somewhat cheaper than to do it during the white flow, I am very sure that such colonies are not worth as much as those made earlier, judging from what the bees are able to accomplish in storing surplus the season following; and it seems that these little swarms are a little on the order of late natural swarms, for they do not winter as well, and they are, consequently, not as desirable. We have, therefore, come to the conclusion that, while it costs more to make our increase early, it is cheaper in the end, and therefore we try to do that at the present time.

A practical honey-producer can buy bees of less successful beekeepers for much less money than he can produce them himself, if he can find any for sale that are in a desirable condition. Sometimes we find desirable bees, and in such cases we buy them instead of trying to make our own increase.

THE CHAPMAN PLAN OF MAKING INCREASE

Mr. S. D. Chapman has a plan somewhat different from these others mentioned. At a period about eight days before the close of the raspberry flow (it would be the same if the flow were from clover or basswood), he hunts out and kills all his queens with the idea of having only young queens with which to go into winter quarters. In ten days, when the queen-cells that have been started come to maturity, half of the bees and brood, including a good queen-cell, is taken out of as many colonies as desired, and put into empty hives, and then both hives are supplied with empty combs from the colonies that died during the winter. As this is about the middle of July, these half-colonies that will soon contain young queens will build up into good colonies for winter, although they will probably need to be fed quite a quantity for winter stores. The bees have eight days of the last of the honey-flow in which to build their cells, which insures the best quality of cells. Furthermore, at this time it is less expensive in the amount of honey it takes to produce the increase; for when one runs for extracted honey, as Mr. Chapman does, this killing of the queens is not likely to cause any loss of honey; and the smaller amount of brood the bees have to care for may be a gain rather than a loss.

Finally, by having young queens to take their flight after the season is over, there is less than one per cent of swarms during that time. We have tried this plan and found it to be a good one.

Mr. E. E. Coveyou, of Petoskey, usually has his own way of doing things, and his method of making up winter loss and working for increase is no exception. When he finds cells being built in any of his colonies preparatory to swarming, the colony is shaken into a hive filled with combs or foundation.* After the bees and queen have been shaken from the combs, the brood is removed to some weak or moderately strong colony, to be taken care of for six or seven days. At the end of this time the brood is placed on a bottom-board beside the before-mentioned medium colony, over which it has been for the previous few days, and both hives are so placed as to get about the same number of flying bees. A new colony will thus be made from the brood.

If he desires to make two colonies from the brood he divides it and sets the two halves on the old stand so as to catch all of the flying force, the original medium colony of this stand then being moved to some other stand. If there are cells to be saved in the brood, a queen-excluder must be used between the upper story of brood and the medium colony before the division.

If this brood from the shaken swarm had been set on a stand of its own at the time of shaking, much of the unsealed larvæ would have been lost by the bees leaving it and going back to the old stand.

If Mr. Coveyou finds that more increase is needed than he can get from the colonies having cells, the required number of cells are provided by the plan already described.

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* If one has the foundation, this is the place to use it, for the combs may be used later.